

# THE IRON AGE

Established 1855

New York, May 7, 1914

Vol. 93 : No. 19

## Cost of a Shop Photographic Department

Expense of Conducting a Gallery and Employing a Commercial Photographer Compared—Experience of the Felt & Tarrant Mfg. Company

Previous articles have appeared in *The Iron Age* bearing upon various aspects of the question of industrial photography in connection with sales and advertising departments as well as the making of records. In the issue of August 22, 1912, the many uses to which a camera may be put, around a manufacturing plant, were cited. In the issue of November 14, 1912, a description of the photographic equipment of the Publicity Department of the Ingersoll-Rand Company was presented. Again in the December 19 issue, of the same year, attention was called to the use which may be made of lantern slides as an assistance in the sales department. In the October 23 issue of last year, em-

phasis was laid upon the possibility of reducing the expense of retouching by a more careful attention to the placing of the object to be photographed in the most favorable position for the purpose. Opportunity now presents itself for offering in connection with a brief description of the photographic facilities of the Felt & Tarrant Mfg. Company, Chicago, interesting data concerning the cost of conducting one's own gallery as compared with buying the services of a commercial photographer.

The Felt & Tarrant Mfg. Company manufactures the Comptometer and its photographic department is employed almost entirely in the service of the advertising department although lantern slides



View of One End of the Photographic Gallery of the Felt & Tarrant Mfg. Company

are also made for use by the sales department. The camera and lens equipment includes the large camera shown in the illustration of one end of the exposure gallery, a Century No. 8 with a Portonit-Goerz Celor lens of the anastigmat type for all short focus general purpose work, a rectilinear lens for long focus work, a Cook Process lens for photographing drawings and reproducing photographs, and for outside work, an 8 x 10-in. view camera with a Turner-Reich anastigmat lens. The gallery equipment also includes a retouching desk for blocking out and retouching negatives, a Globe enameler, a burnisher and a print trimmer. For making lantern slides, the negative is mounted in the plate adapter of an enlarging camera and photographed directly on the sensitized slide.

The dark room is arranged with a completeness and convenience that evidence an unusual confidence in the expediency of this department. The window in the background is glazed with ruby glass and the small panel provides for the insertion of an enlarging camera. The developing room is isolated from the corridor of the building by an anteroom and its concrete walls are painted black. The racks and washing baths are entirely of metal. A steel hood, with a motor-driven exhaust fan in the flue, draws off the fumes from over the sinks and keeps the air in the room fresh. The ventilators for ingress of air are placed in the sidewalls at the floor. Another fan is placed to send a current of air over the plate drying rack to speed up that process. The printing is done by artificial light in the printing machine shown in the illustration directly in front of the window and furnished by the Eastman Kodak Company, Rochester, N. Y.

Varying circumstances will make different arrangements regarding photographs, desirable for various concerns. For some the problem works out best to have an employee who has some skill along this line make the exposures with his own or the company's camera and send the photographs for developing and printing to a commercial photographer, but an investigation of a large number of instances where the amount of work done in a year exceeded \$1500 points very clearly to the economy of installing a photographing plant. A few figures are available showing the relative cost of making

negatives and prints of different sizes in one's own photographic department compared with the usual charges made by commercial photographers:

Concern's own photographic departments	Outside photographers
5 x 7-in. negatives.....	25c to 40c
8 x 10-in. negatives.....	75c to \$1
8 1/2 x 11-in. prints, unmounted.....	\$1 to \$2
8 1/2 x 11-in. prints, mounted.....	15c to 20c
16 x 20-in. bromide enlargements:	15c to 50c
Unmounted .....	20c up
Mounted .....	85c    \$1.75 to \$2
	\$1.15    \$2 to \$2.25

General estimates place the cost of a complete plant such as would suffice for practically every demand of the ordinary business at about \$500. Such a plant would include about the facilities described above. In a plant, the operating cost of which averaged about \$150 a month or \$1800 a year, there were made 525 original negatives, 275 negatives developed from exposures at branch offices (of these negatives nearly 100 required special work in blocking out and retouching), 200 lantern slides were prepared and a total of about 7000 prints, in addition to about 200 enlargements made. The distribution of expense charged against the photographic gallery for this work shows the following:

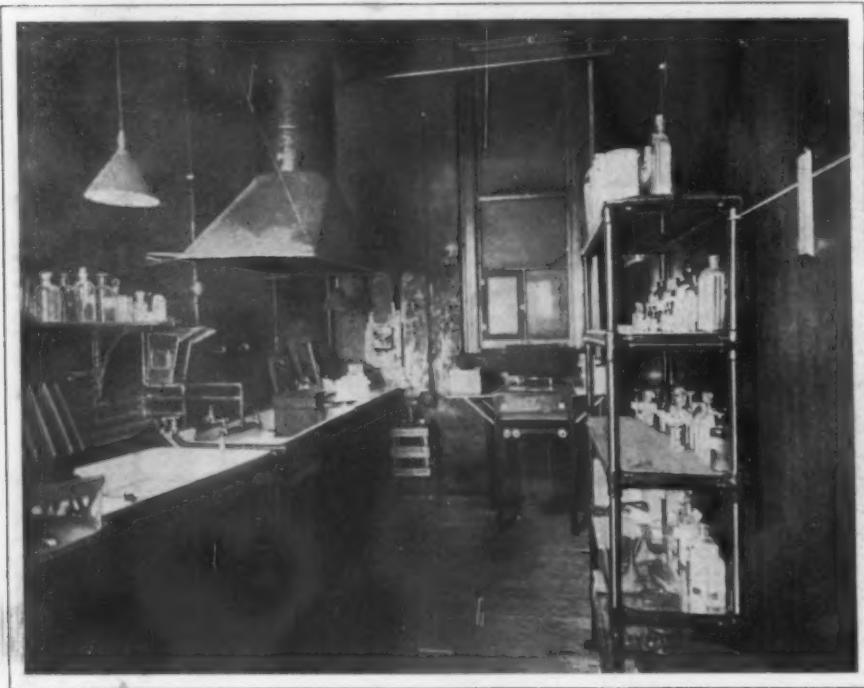
Salary, photographer .....	\$1,050
Wages, additional help .....	100
Plates for 800 negatives .....	100
Sensitized paper .....	180
Enlarging paper .....	50
Lantern slide materials .....	20
Developing materials .....	30
Overhead on equipment .....	25
Rent .....	150
Supervision and incidentals .....	95
	\$1,800

This approximate estimate does not represent all the work that was delivered by the gallery in question and so the following comparison is more emphatic. For the work turned out the average commercial photographer's charges would have been approximately as follows:

800 negatives .....	\$1,000
Retouching 80 jobs .....	110
7,000 prints .....	1,050
200 enlargements .....	225
300 lantern slides .....	90
Total .....	\$2,475
Cost, including overhead .....	1,800
Actual saving .....	\$675

This saving of \$675 is more than 35 per cent.

Where the amount of work is greater it will be found that the saving increases proportionately. But the question of economy is only one of many reasons that those who have installed their own equipment advance in favor of so doing. It is proverbial that the commercial photographer fails to get the point of the majority of the industrial photographs that require to be taken. One's own photographer, being familiar with the situation, can do this without taking the time of some other valuable employee to explain what is required. Frequently the question of speed also becomes one of such importance that the results a plant photographic gallery is able to give outweigh the cost.



The Dark Room



The Opposite End of the Gallery to That Shown on Page 1117

## SAFEGUARDING THE SODA TANK

### Suggestions for the Protection of Workmen Cleaning Small Machined Parts

BY JAMES E. COOLEY

The usual method for cleaning the oil and chips from work is to dip the pieces into a small tank of hot water and sal-soda. These tanks are circular in shape and are set in the center of a drip pan. Some of the tanks are to be found in rooms built especially for washing work, extracting oil from chips, etc., but the greater number are located where they are accessible to all workmen who are required to wash their work, one or more being placed in a room or department. Because the soda water tank is no small factor as a contributor to the sum total of machine shop accidents and because they have long been overlooked in having safeguards put around them, a few suggestions are given here that will prevent accidents around one of these tanks.

The first of these suggestions is seen in the guard rail *a* erected around the drip pan. This is to prevent the workman from stumbling over the edges of the pan and confining the approach to the tank to one or two entrances. It is as necessary to have a guard rail here as it is to have one near a flywheel or other dangerously exposed machinery.

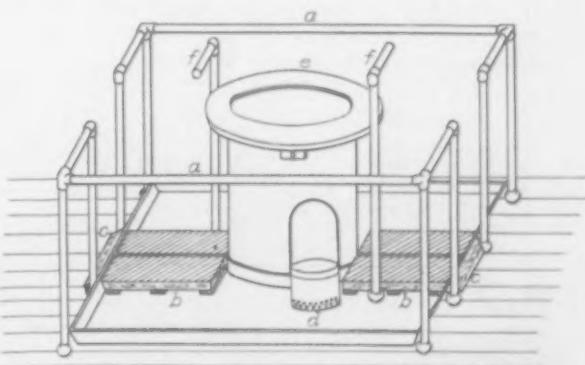
In washing work of any description, the workman has to stand in the drip pan to dip the work into the tank. As the pan is generally wet and greasy the danger of slipping is always present. A platform, such as is shown at *b*, should be provided for the workmen to stand on. A safety tread cover should be furnished for this platform, or it should be sprinkled with sand. The beveled pieces or risers *c* prevent stumbling at the entrance.

When several pieces are to be washed they are placed in a washer similar to the one shown at *d*, which is dipped into the hot soda and shaken vigorously. It is when lifting this washer out of the tank before the water has drained off that many workmen have scalded their legs and feet. To prevent accidents of this kind a circular shelf, *e*, on which to rest the washer while the water drains off should be placed over and around the edges of the tank.

A still further precaution is to erect an upright *f*, directly in front of where a workman stands. It will then be necessary for the workman to swing the washer around to one side instead of pulling it toward him when putting it down. These uprights will prevent the workmen from falling into the tank and also will be found handy to take hold of when dipping shafts in the tank to wash out splines, keyways, etc. Whenever any overhead work such as fixing shafting or adjusting a belt, etc., is attempted directly above the soda tank the top of the tank should be covered over. The platform *b* will be found useful for this purpose, as it can be picked up easily and placed over the tank.

### Information for Exporters

R. L. Ardrey, at one time Chicago editorial representative of *The Iron Age*, is now publishing a quarterly international trade magazine entitled "Made in U. S. A." which makes a specialty of information for exporters. Its subscription price is \$2 per year and the publication office is 234 South La Salle street, Chicago. The April issue contains an ocean steamship guide for the use of exporters at interior points. Mr. Ardrey states that one of the great difficulties of intending exporters is that they do not know how to ship, especially from interior points. This issue is of special value to them. It shows all the lines out of the United States and Canada, being claimed to be the only publication giving this data. It also shows the direct ports reached without transshipping and the number of days out to each port. A sample copy of



A Suggested Scheme of Safeguards Around a Soda Tank Used for Cleaning Oil and Chips from Machined Parts

this issue will be sent by Mr. Ardrey without charge to any manufacturer who is interested in export trade.

A works publication devoted to the interest of the safety movement has been established for the benefit of the employees of the Raritan Copper Works, Perth Amboy, N. J. It is known as the *Ingots*, and the first number states, in showing the accomplishments of the safety movement at the Raritan works, that accidents have decreased 47 per cent., comparing April, 1914, with September, 1913. The incapacitating accidents in March, 1913, amounted to 21, while in March of this year they did not exceed 14.

The Murphy Machinery & Equipment Company, St. Louis, has leased new quarters at 1410 North Broadway.

# Bolivia's Tin Resources and the United States

## Possibility of a Smelter on Our Atlantic Coast with the Canal Open—Good Prospects Both for Tin Mining and for Railroads

BY CHARLES M. PEPPER\*

ORURO, BOLIVIA, April 20, 1914.—Bolivia was once described by a geographer as a silver table with gold legs. He was thinking of the enormous silver production during the centuries following the Spanish Conquest and also of the gold which was obtained chiefly in the placer regions. To call the country a tin table in this century might seem to cheapen it, but that is in fact what the great central tableland is. Tin in the 20th century is becoming to Bolivia what silver and gold were in the 17th and 18th centuries. It is the chief mineral wealth, and there is every reason to believe that the productiveness will continue to grow.

### BOLIVIAN TIN ONE-FIFTH OF TOTAL

Tin mining really dates back less than a quarter of a century, and it is only within the last ten years that the growth has become notable, and Bolivia has taken her place next to the Malay Straits Settlement as the tin producing region. In ordinary years about 20 per cent. of the world's tin production may be attributed to Bolivia.

\*Mr. Pepper, who was for eight years prior to June, 1913, foreign trade expert of the State Department at Washington, has made an extended tour of South America, studying developments in the trade of the United States likely to follow the opening of the Panama Canal. He had had much to do with trade and tariff negotiations for the United States with South American countries. The first of a series of letters to *The Iron Age*, giving the results of Mr. Pepper's recent studies was published October 16, 1913, dealing generally with initial plans for commerce by way of the Panama Canal. The various countries were then taken up as follows: Peru, November 13, 1913; Chile, January 1 and February 5, 1914; Argentina, March 5; Brazil, April 2. A concluding article on Colombia will appear early in June.—EDITOR.



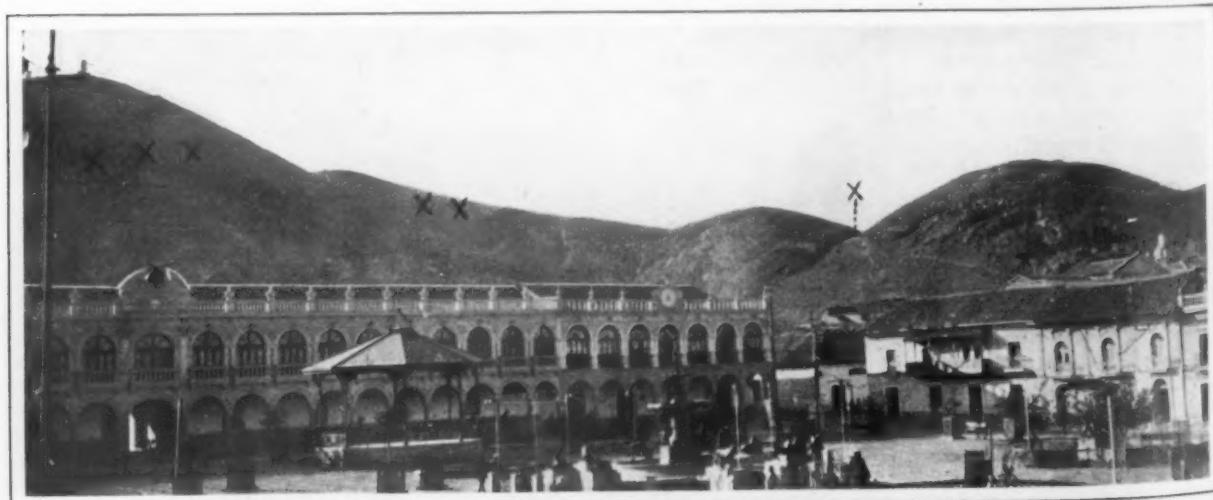
Cerro Choroqueo, Santa Barbara, Tin Mines. Altitude over 18,000 ft. Bismuth, silver and wolfram are also produced

Confusion exists as to the actual production, because the figures of the output of the mines usually are given in terms of barilla, or concentrates, which might be called crude tin. The actual output, however, is easily ascertained since the Government levies an export tax, and the exportation during a given year is about equal to the production. This export tax is based on the calculation that the concentrates yield 60 per cent. of pure tin, and that is, in fact, about the average, though there is some very high grade barilla and some low grade. In the Government statistics metric tons are also implied, but the metric ton is so near the gross ton that the difference can be disregarded. In order to know the exact production for a period of years, I got the official statistics which follow:

Year	Barilla, metric tons	Tin, metric tons
1908	29,938	17,963
1909	35,566	21,340
1910	38,548	23,129
1911	38,100	22,560
1912	35,834	21,500

In addition to the concentrates, probably 500 tons of tin are shipped as bars.

Oruro is the center of the richest tin-mining district, although there is considerable production in the La Paz district. The concentrates are found in combination with silver ore, and are separated at the various reduction plants. Some of these are quite modern, and have the latest improved machinery.



Plaza in Oruro, the Tin Mining Center of Bolivia. Mines are in the hills, being designated by crosses. Properties of Compania Minera de Oruro

Others are not so progressive, but as they get fresh capital they seek to improve their equipment.

#### BOLIVIA'S BONANZA KING

The leading mining companies are operated by Bolivian, Chilean and English capital. The greatest mine owner in Bolivia today, and one of the greatest in the world, is Señor Simon Patino. His history parallels the romance of the bonanza kings of the Pacific coast or the multi-millionaires of South Africa.

Ten years ago he was a poor man who knew something of mining, and who had unlimited faith in the tin deposits of his country. He got together a few thousand dollars with which he obtained control of one of the smaller mines. It justified his expectations, and he proceeded with its development. Then he began to acquire other mines, buying control of the Huanani from an English company, and also getting the Uncia, which is the most productive of all the group whose control he has concentrated in his own hands. The output from the Patino group is now said to approximate \$10,000,000 annually. All these mines are equipped with up-to-date machinery. Competent engineers, usually foreigners, are also employed. The Uncia mine in its technical management is in charge of German engineers.

#### HIGH FUEL AND HIGH ALTITUDES

One source of expense in the reduction plants is the high cost of fuel. Bolivia has no coal deposits that are commercially available. Coal has to be brought up from the coast, either from Antofagasta over the Antofagasta & Bolivia Railway, a distance of 575 miles, or from the Peruvian port of Mollendo and across Lake Titicaca. The completion of the Arica-La Paz Railway affords a shorter route, but the grades on this line are so heavy that there is not much prospect of cheaper freight.

In some years coal has been as high as \$50 a ton. This, in part, explains why so small a quantity of tin bars is produced, and why it is cheaper to ship the concentrates down to Antofagasta. Hydroelectric power has not yet solved the problem of fuel for the smelter.

Another difficulty connected with tin mining in Bolivia is the great altitude at which the tin deposits are located. Oruro itself is on the great tableland, 12,000 ft. above sea level, and the mineral deposits in the surrounding regions are from 1000 to 3000 ft. higher. In the La Paz district the deposits are worked as high as 17,500 ft., although the European engineers and managers have to confine their activities to an elevation of about 15,000 ft. Under their direction the native Indian labor works the higher lodes.

This native labor is sturdy and competent. There is enough of it to assure further development of the tin mining industry, but not at the very high altitudes. New railroad construction, however, is encouraging the development of some of the districts where the deposits are lower, and where labor will be more easily obtainable. Yet it is not likely that miners from other countries will ever have much to do with the development of Bolivia's mineral de-

posits. The main reliance must always be on the native Indian labor.

Additions to the normal output of the mines are now being obtained by working dumps. Years ago when silver mining was at its height and the value of the tin deposits was not appreciated, large quantities of the latter, together with the tailings and waste ore near the mines, was dumped. The silver lodes are found at considerable depth, and in working the silver mines on a large scale, large quantities of tin-carrying rock had to be removed before the silver was reached. These dumps usually were near the mouths of the shafts. Since the extension of the railroads into the mining district and the cheapening of freights, barilla containing 50 per cent. of metallic tin has been recovered from many of these dumps by a simple washing process, and the exploitation of this source of wealth is far from being at an end.

#### AN AMERICAN TIN SMELTER POSSIBLE

For a country which is so large a consumer of tin as the United States it seems strange that American capital has had so little to do with the development of the Bolivian tin mines. However timorous it may be in respect to commercial enterprises in South America, American capital never hesitates at a mining venture. There have been two or three companies formed in the United States, one of them in Pennsylvania, but they either have become discouraged or have not had capital enough to go forward.

Boston interests have some tin properties, but these are not now in operation. When the American banking group made a contract with the Bolivian Government to build railroads, some of their individual members also acquired mineral concessions, but apparently they have not followed up the development of the properties.

Notwithstanding that the United States consumes an enormous amount of tin there are as yet no smelters on the Atlantic coast for the treatment of the concentrates. Substantially all the Bolivian product goes to England, the amount being from 93 to 95 per cent. annually. All these concentrates are now shipped around the Horn, or through the Straits of Magellan. The query occurs whether, after the Panama Canal is opened, they will not take the shorter course through the canal, for the tolls do not seem to be too high. With the opening of the canal it would seem possible to establish a smelter somewhere on the Atlantic coast for the treatment of Bolivian tin concentrates.

#### LARGER DEVELOPMENT IN THE FUTURE

In one sense the future of the tin industry in Bolivia may be said to be the country's economic future, for on it rests the chief element in the fiscal system. Bolivia obtains more than \$1,000,000 from the export tax on tin, and for a country whose expenditures are on a modest scale this is an item of much importance. The Government, therefore, may be depended on, aside from other considerations, to do all it can to develop tin mining. Im-



Ruins of Inca Civilization at Talcuhano near Lake Titicaca

proved transportation facilities are assured, and there seems every reason to predict a further steady increase in Bolivian tin production, though it may not be continuous year by year. The certainty of increased production is another reason why the subject is worthy of attention of American capitalists who realize the possibility of the home market for tin plate.

#### RICH PROMISE IN OTHER METALS

Silver mining in Bolivia has been in abeyance for some years past, due largely to the supposed exhaustion of the old mines, which have been worked for centuries, and to the lack of transportation facilities. The most profitable silver mine in the country, Huanchaca, is situated on a railroad spur, running out from Uyuni, which is on the railroad from Antofagasta. For many years this was one of the most productive silver mines in the

Increased prices for copper should give some stimulus to the more systematic working of the copper deposits of Bolivia. These are located at Corocoro. The Arica-La Paz Railway now reaches these mines, and affords a short haul down to the sea. Lack of harmony among the different mining groups is said to be one cause of the limited development of the Corocoro fields. Some years ago a New York banking house obtained an option on one group of mines, and was ready to spend large sums if other mines could be obtained. The owners, however, had extravagant notions of the value of their property, and so nothing came of the proposed deal.

Wolfram, bismuth, zinc, and antimony are among other sources of Bolivia's mineral wealth, but they do not enter largely into the present stage of mining exploitation.

#### RAILROAD EXPANSION

Bolivia's progressive railroad policy has had



Plaza at Potosi, the Ancient Center of Bolivian Silver Mining. Palace of the Municipal Governor

world. Then it was flooded, and various difficulties were encountered in its operation, which caused the suspension of dividends. My impression is that within the last year the mine has again resumed dividends, though the output is not so large as formerly.

Potosi is the historic silver mining region of Bolivia. It was from here that for centuries such vast quantities of silver were obtained. The old Spanish mint, and subsequently the national mint of Bolivia, was established at Potosi. Silver mining declined to the point where it was thought that there was no prospect of its revival, unless transportation facilities could be obtained. The Bolivian Government, in pursuance of its general policy, built a branch line from Mulata on the Antofagasta & Bolivia Railway to Potosi. This line is now in operation, and in another year or two it may be possible to determine to what extent cheap transportation and modern machinery can redevelop the Potosi fields.

Gold mining is also to be rejuvenated, if the expectations of a group of American and Bolivian capitalists are realized. A number of the properties have been combined, and the plan is to work them on an extensive scale. Dredging machinery is an important factor in any future development of gold mining in Bolivia.

much to do with the present satisfactory condition of the country. This policy is still maintained, but its main purpose has been accomplished. This was to link the country up so that there would be through railroad communication from the northern border at Lake Titicaca to the Argentine frontier on the south. The construction of another hundred miles will complete these links. One of them is from Uyuni to Tupiza in southern Bolivia. Sixty miles of this link have been built out from Uyuni, and about 50 miles remain to be constructed.

This extension to Tupiza makes accessible some of the tin-bearing districts which have not been exploited on account of the lack of transportation facilities. The remaining link will be from Tupiza to Quiaca, on the border of Argentina, also a distance of 50 miles. When these two links are completed, southern Bolivia will have rail access both to the Atlantic and to the Pacific.

The branch line to Potosi, which I have described, was part of the general plan. Another branch line from Oruro to Cochabamba, the center of a rich agricultural district, is now in progress. Funds for this project have not been too plentiful, and Señor Patino, the tin-mining magnate, is credited with the patriotic purpose of aiding the Government to complete the line by advancing the funds himself.

With the Pan-American sections practically completed between the northern and the southern border of the country, and with railroad communication with the Pacific augmented, the next step in the Bolivian programme is to reach the agricultural section known as the river and forest region. This is with a view to developing tropical agriculture, and also to making easier the exploitation of the rubber districts. The Government has some projects of its own, but it seems disposed to encourage private enterprise to undertake most of the lines.

#### THE FARQUHAR CONCESSIONS

Important concessions have been granted to the Farquhar Syndicate. This is the syndicate organized by Percival Farquhar, the American, whose splendid schemes for joining up the railroad systems of the interior of South America have caused him to be called the Harriman of South America. Mr. Farquhar and his associates obtained control of the Antofagasta & Bolivia Railway, which was one of the best paying systems in South America. Its English owners drew such comfortable dividends from it that they were very unprogressive, and not disposed to exert themselves for the further development of Bolivia. Mr. Farquhar and his associates are more progressive and more ambitious. Though the condition of the world's money market may cause delay in putting their plans into effect, they will, nevertheless, ultimately go forward with their new lines, and the great central tableland will be put in rail communication with the regions of the great rivers whose products will reach the Atlantic both through the Amazon at Para and through the Plate, at Montevideo.

I have given in brief outline what the Bolivian national policy is in regard to railroads, what it already has accomplished, and what is yet to be accomplished, because it has so important a bearing on the industrial development of the country, and also because it indicates why Bolivia is, and will continue, a good market for iron and steel products.

#### WIRELESS TELEGRAPHY WILL DO MUCH

Supplementary to the railroad policy, a word ought to be said about wireless telegraphy. Some day it will be necessary to write a chapter on what wireless is doing for the civilization of the vast interior regions of South America. We are so accustomed to think of it in connection with ocean distances that we do not realize its possibilities for interior development. Bolivia, like her neighbor, Peru, has realized the full value of wireless, and contracts have been made for the installation of a wireless system which will enable the capital and all the important centers to be in touch with the remotest river and mountain regions. This is a very important factor in the orderly administration of these regions.

Following the more systematic development of the mining industry there may be an immigration, or a colonization movement for Bolivia. Colonization cannot take place on the high tableland, because there are few regions which could supply people to populate a plateau 12,000 ft. above sea level. Moreover, the means of subsistence are not capable of development for the support of a population much larger than that of the present Indian inhabitants, but it is thought that the sea-level regions in the southeast of the country are capable of colonization for tropical agriculture, and there are various projects with this end in view. None of them is likely to take on imposing proportions

during the next ten years, but with the opening up of the agricultural regions by means of railroads some growth of population is assured.

#### A PROMISING OUTLOOK

Bolivia today, considered from all points of view—fiscal, industrial and political—is in as good a position as any country in South America. Boundary disputes with her neighbors are nearly all adjusted, and the country's statesmen are able to give their attention to questions of domestic policy and internal development.

It must be remembered that Bolivia is not a country of revolutions. There have been revolutions in the past, but these have not been so frequent as to become a habit. The destinies of the country are controlled by a small group of able and patriotic men. The political system is a good one, and makes for stability.

Public affairs, and in particular the finances, are well administered. Last year the actual revenues were greater than the estimated revenues. This is in marked contrast with most of the South American countries where the deficit was greater than it had been estimated. The money of the country may be said to rest on a silver basis with a gold expectation, but stability is maintained, and there are no violent fluctuations, though at times large quantities of English sovereigns are imported. The complete reform of the finances is now under consideration, and several of the plans proposed seem to be both sound and practicable.

Bolivia's foreign commerce, considering its isolated situation as a mid-continent country, is larger than might be supposed. The total volume exceeds \$50,000,000 annually, with the exports greater than the imports, though the disproportion is not very marked. Though the United States takes very little from Bolivia, the figures rarely reaching \$250,000 a year, the country is a good customer for our products. The imports from the United States range from \$3,500,000 to \$4,000,000 per year. The latter figures are reached when railroad building is active. The United States is the chief source of supply for rails and railroad material, as well as for other iron and steel products, including some mining machinery.

Surveys are being made by engineers of the Pennsylvania Water Supply Commission in mountain regions contiguous to industrial communities in order to determine the resources of the State in water supply. Some years ago a survey of the State to locate all streams was made, and the present survey amounts in effect to an inventory of the water, taking into account the volume, especially the amount that can be relied upon for industrial purposes and the horse power that can be made available. It is expected that information regarding the water power will be in hand by the end of 1915. Until this information is gathered it is improbable that any charters for water-power companies will be granted.

Recent business with the iron and steel industry is reported by the General Electric Company as follows: The American Iron & Steel Mfg. Company, Lebanon, Pa., is to install a 1500-hp. induction mill-type motor with sectional control equipment. The Bethlehem Steel Company, South Bethlehem, Pa., has ordered nine motors ranging from 10 hp. to 50 hp., two additional 125-hp. and two 150-hp. induction motors. The Riter-Conley Mfg. Company, Pittsburgh, has ordered 32 motors of 10-hp. and 25-hp. capacities. The Hubbard Steel Foundry Company, East Chicago, Ind., will add to its plant two 100-kva. synchronous motors with 5-kw. exciters and accessories.

# Built-Up High-Speed Steel Cutting Tools



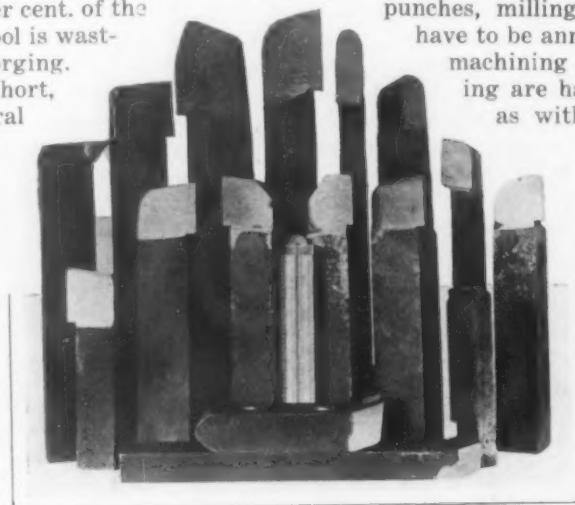
## Making Tools by Welding High-Speed Steel to Low-Carbon Shanks, and the Economies Claimed for the Product

**A**DOLPH ROSNER, Bridgeport, Conn., has developed a process of welding high-speed to low-carbon steel (0.25 to 0.60 per cent. carbon). The high-speed steel piece is not dovetailed in, nor brazed, but welded against the flat surface of the low-carbon steel base, to make one solid piece. Any kind or make of high-speed steel, Mr. Rosner says, can be welded successfully.

It is calculated that 85 per cent. of the high-speed steel in a lathe tool is wasted in grinding, also in reforging.

When the tool gets too short, after being reforged several times, it is commonly scrapped. The fact that only 15 per cent. of the steel in a lathe tool is actually used for cutting is what led to developing a new form of cutting tool to save a lot of high-speed steel that was heretofore wasted. The accompanying drawings and photographs show the construction of the tools. A small piece of high-speed steel for the cutting edge costing, say, 75 cents to \$1 per pound, is welded to a low-carbon steel base, called the shank, costing about 2 or 3 cents per pound.

The two pieces to be welded are heated in a gas furnace. The high-speed steel is heated slowly to welding heat, over 2000 deg. F. The pieces are taken out of the furnace and put under pressure to unite



the two metals. This takes only a few seconds. A special flux is used in welding.

It has been found that the quicker the temperature is brought from hardening temperature down to about 1300 deg. F., the better the cutting quality of the tool. The hardening of the tool takes place at the same time and with the same heat as the welding. Right after welding the tools are ready to be ground and used. Welded forming tools, dies, punches, milling cutters, taps, knives, etc., have to be annealed after welding to make machining possible, and after machining are hardened in the regular way, as with tools made of high-speed steel alone.

Tools made in the way described have been put on the market by Mr. Rosner for immediate use without reforging and with the idea that when the cutting edge is worn out another piece of high-speed steel may be welded on to the left-over shank. The tools can, of course, be annealed, machined or rehardened, as desired. It

is stated also that it is possible to bend or forge such tools at the weld to a certain extent, if done at high temperature. With regard to the low-carbon steel shank, it is held that as the low-carbon steel is such that it will stiffen by quenching in water, it is suitable even for long overhanging tools.

In answer to the claim that there is no high-

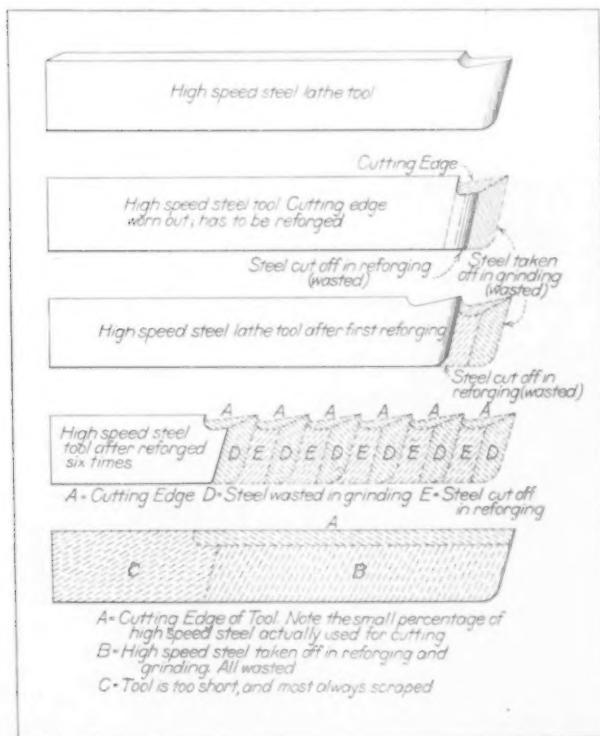
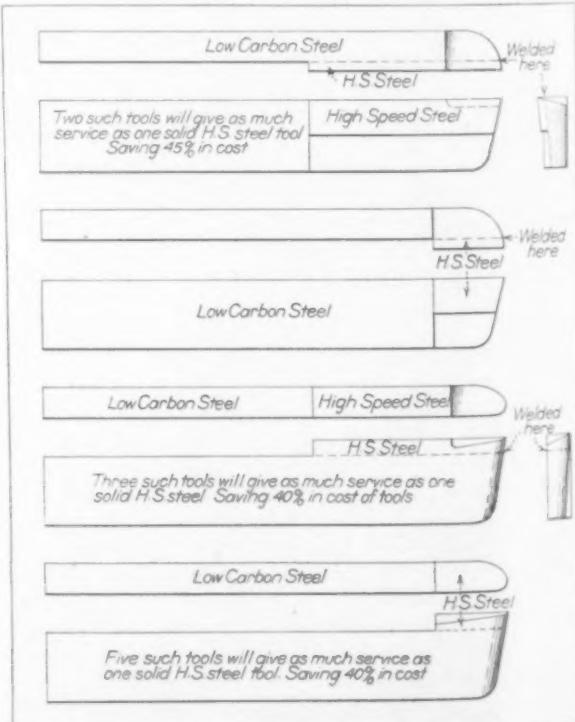
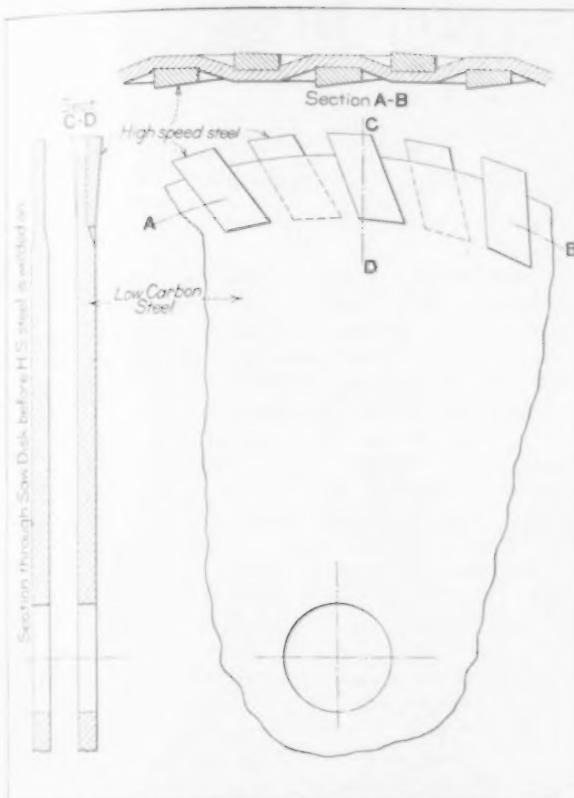


Diagram to Show the Small Percentage of High-Speed Steel Actually Used in a Lathe Tool



Built-Up Lathe or Planing Machine Tools; Tool May be Rehardened



Circular Metal Saw With High-Speed Steel Cutters Welded to Low-Carbon Steel Disk

speed steel wasted in a machine shop, because when a tool gets too short it is drawn out to a smaller section and used in another machine, Mr. Rosner says there is not always a call for a smaller section, and besides it costs something to draw out the steel to a certain dimension; that this will bring up the cost per pound of such drawn-out steel in small sections to probably as high as \$2.

As regards costs, Mr. Rosner supplies the following figures: It is estimated that a lathe side tool 10 in. long, made of  $\frac{3}{4}$  x  $1\frac{1}{2}$ -in. high-speed steel can be reforged and rehardened six times before it gets too short to be used again. A small piece is left over and is most always scrapped. The cost of reforging of tools increases with the cross-section of the high-speed steel.

Raw material, 3 lb., at 75c.....	\$2.25
Reforging and hardening, 6 times, at 20c.....	1.20
	\$3.45
Less 1.3 lb. of scrap, at 6c.....	.08
Net cost of high-speed steel lathe tool when all used up.....	\$3.37
The reforging and hardening of such a high-speed steel tool would require:	
First heating to 1500 deg. F.....	4 min.
Trimming and forging.....	2 min.
Second heating to 1500 deg. F.....	1 min.
Finish forging.....	1 min.
Rough grinding.....	1 min.
Heating to 2100 deg. for hardening.....	4 min.
Quenching.....	1 min.
Time lost between tools (for fixing fire)...	1 $\frac{1}{2}$ min.
Total time.....	15 $\frac{1}{2}$ min.
Labor:	
1 blacksmith, at 30c. per hour, and 1 blacksmith helper, at 20c. per hour \$0.0083 per min.	
15 $\frac{1}{2}$ minutes, at \$0.0083.....	\$0.1286
General shop expenses, 60 per cent.....	0.0771
Cost of one reforging and hardening.....	\$0.2057

In the case of the same size built-up tool, a small piece of high-speed steel  $1\frac{1}{8}$  in. long,  $\frac{3}{4}$  in. wide and  $\frac{1}{4}$  in. thick is welded to the flat side of the shank to form the cutting edge with the right clearance angle. A longer high-speed steel cutting edge could be welded on, but for this comparison one  $1\frac{1}{8}$  in. long is used to get unfavorable conditions. Five built-up tools with a cutting edge of  $1\frac{1}{8}$  in. long are necessary to do the same amount

of work as one solid high-speed steel tool would, reforging it six times until it is too short to use. When one built-up tool is used up, a new one 10 in. long is drawn out of stock. The low-carbon steel shank of the worn-out tool may be scrapped or else another high-speed steel cutting edge is welded on. This would give a tool about 8 in. long. The comparison between the two tools would be:

One 3-lb. all high speed steel lathe tool, including raw material and cost of reforgeing 6 times.....	\$3.37
Five built-up lathe tools of the same size, sold for 40c. each, ready to use.....	2.00
Saving by using welded tools, 41 per cent.....	\$1.37

### New Steel Sheet Piling Corner Section

The Lackawanna Steel Company, Lackawanna, N. Y., is rolling a new form of corner section for use in connection with its steel sheet piling, which was illustrated in *The Iron Age*, June 20, 1912. This section is designed for 90-deg. corners of rectangular cofferdams or retaining walls and can be used with either the hook or the guard on the outside. This section is designed to take the place of the fabricated corner members formerly used. It is stated that these corners are more readily driven than the specially fabricated ones and weigh less per lineal foot. The corners are intended for use where the conditions of load are not excessive. Practically all of the requirements will be met by the new corner, but if a variation from the 90-deg. angle is desired, special angles can be rolled.



A New Form of Rolled Steel Sheet Piling Section for 90-deg. Corners for Use in Place of the Fabricated Corners Formerly Employed

### Pacific Coast Metal Trades Association

The eighth annual convention of the United Metal Trades Association of the Pacific coast was held in Spokane, Wash., April 18, with members present from Sedro-Wooley, Everett, Seattle, Tacoma, Spokane and Portland. The reports of the officers showed the association to be in better condition numerically and financially than ever before. The retiring president, A. G. Labbe, in the course of his report, said:

The greatest handicap to the development of manufactures on the Pacific coast is the political craze that has seized the public, the unskilled employee in particular, for the enactment of restricting and regulating laws without any regard for the ultimate effect. We have been assailed by a horde of organizers and agitators who want to ride into office on the labor vote. They employ no labor, pay no taxes, and do not work except to try out experiments at the employers' expense. To attract votes, they institute minimum wage laws, minimum hour laws, compensation laws, child labor laws, and every other kind of law. Voters, taxpayers, and, above all, laborers, must soon come to realize that this is not conducive to large pay rolls and prosperity. The average voter is being swamped by sentiment and misinformed by a commercialized press.

The officers elected were: President, F. G. Frink, Washington Iron Works, Seattle; first vice-president, J. M. Fitzpatrick, Union Iron Works, Spokane; second vice-president, Eugene Roberts, Puget Sound Iron and Steel Works, Tacoma; third vice-president, A. M. Clark, Columbia Steel Company, Portland; treasurer, O. E. Heintz, Pacific Iron Works, Portland.

The Fitzsimons Company, manufacturer of polished shafting and special shapes, Youngstown, Ohio, has established an office at 2496 Broadway, S. E., Cleveland, Ohio, which is in charge of C. E. Lowe.

# Strains in Rolled Brass and Bronze Bars\*

How These Are Measured and Their Effect  
on the Properties of Alloys—Annealing Lowers  
Elastic Limit and Relieves Internal Stresses

BY JAMES E. HOWARD†

Tests recently made by the author upon hard rolled yellow brass, Tobin bronze, phosphor bronze, in bars and sheet form, and rolled copper, furnish the results here presented. The internal strains measured were those which were introduced into the metal by the processes of manufacture, through which the material had passed, and other strains caused by bending the bars or by peining the surface of the metal with a light-weight hand hammer. Some of the test pieces were moderately heated, using a hot water bath, and one was annealed at a temperature of about 1040 deg. F.

A description of the material used, its treatment during testing and the results obtained, are shown on a series of diagrams. Figs. 1 and 2 show two types of test pieces; one is an illustration of a plain hexagonal brass bar which had had its flat surfaces planed off and subsequently peined; on the

be remarked that we have here the means of judging of the elastic limit of the metal by use of the simple equipment employed in making these tests. When the four peined sides were planed off  $1/16$  in. each, the bar recovered 0.0011 in. in length. Assuming the modulus of elasticity of the metal to have a value of 15,000,000 lb. per sq. in., this recovery, which was a tensile strain, corresponds to a stress of 1650 lb. per sq. in. in the interior of the bar, since that part contracted in length when the restraining metal of the exterior was removed.

The exterior metal of rolled rods, as will later appear, is commonly in a state of compression, but this bar had been overstrained by the peining of four of its sides, and the fifth and sixth sides, which normally would be expected in compression, were in consequence of the peining, put into a state of tension. It therefore followed, when the fifth and sixth sides were planed off, that the bar lengthened, as shown upon the diagram.

All six sides of the bar were next peined, resulting in a considerable extension of the bar. The exterior metal was at this stage in a state of high compression. It was not disturbed by the moderate heating given when raised to a temperature of

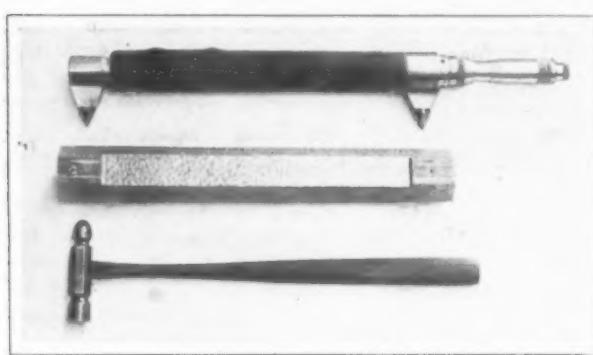


Fig. 1—Peined Hexagonal Brass Bar with Peining Hammer and Strain Gauge

other print appear two bent bars. Small drilled and countersunk holes are shown on the faces of the specimens, the holes defining the extremities of the gauged lengths which were measured at different stages by means of a strain gauge. The testing equipment made use of in these tests is also shown on these prints, consisting of a 4-oz. hand hammer, for peining the surfaces of the test pieces, and a strain gauge for measuring the effect both of the peining and the machine work done in turning down or planing off the specimens.

Fig. 3 refers to tests made upon a  $1\frac{1}{2}$ -in. hexagonal, rolled brass bar. The treatment of this bar consisted in peining opposite surfaces, two at a time, planing off the surfaces, repeining and finally drilling a  $1\frac{1}{16}$ -in. hole through the bar. The bar was measured at the different stages.

The result of peining two sides was to elongate the bar 0.0021 in. on a gauged length of 10 in. Peining two more sides, the extension was increased to 0.0040 in. A part of this extension was permanent set as shown when the peined surfaces were planed off. That is, the metal at the central core of the bar did not have a very high elastic limit and the recovery in length was not complete when the peined surfaces were removed. It may

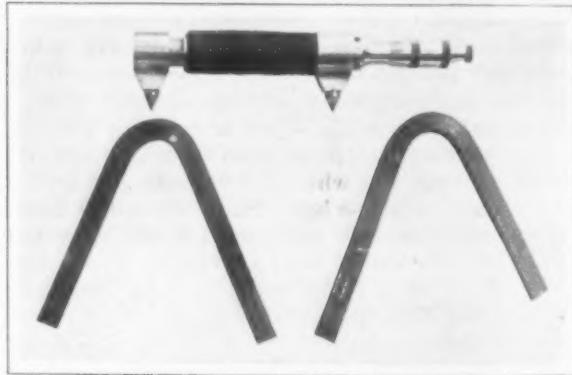


Fig. 2—Type of Bending Bar with Strain Gauge

212 deg. F. The metal at the center of the bar was necessarily in tension, opposing the compression metal of the peined surface. A hole was drilled through the bar, removing the tension metal, whereupon the exterior shell expanded in length 0.0042 in., which corresponds to a stress of 6300 lb. per sq. in. compression in the exterior shell.

The magnitude of strains existing in, or which can be introduced in brass and bronze bars, makes the initial state of the metal a matter of interest and importance when considering the uses of the material where working stresses are not expected to cause permanent deformations.

In the case of a rolled rod of Tobin bronze, the tensile properties of this bar were much higher than those of the yellow brass hexagon. Upon peining the cylindrical surface the bar extended 0.0032 in. Turning the bar down  $1/8$  in. in diameter it not only returned to its original length, but passed beyond and was shorter than in its original condition, due to preexisting internal strains. The bar was further turned down in successive stages,

\*Portions of a paper presented before the American Institute of Metals and to be printed in full in its proceedings.

†Engineer-physicist, Interstate Commerce Commission, Washington, D. C.

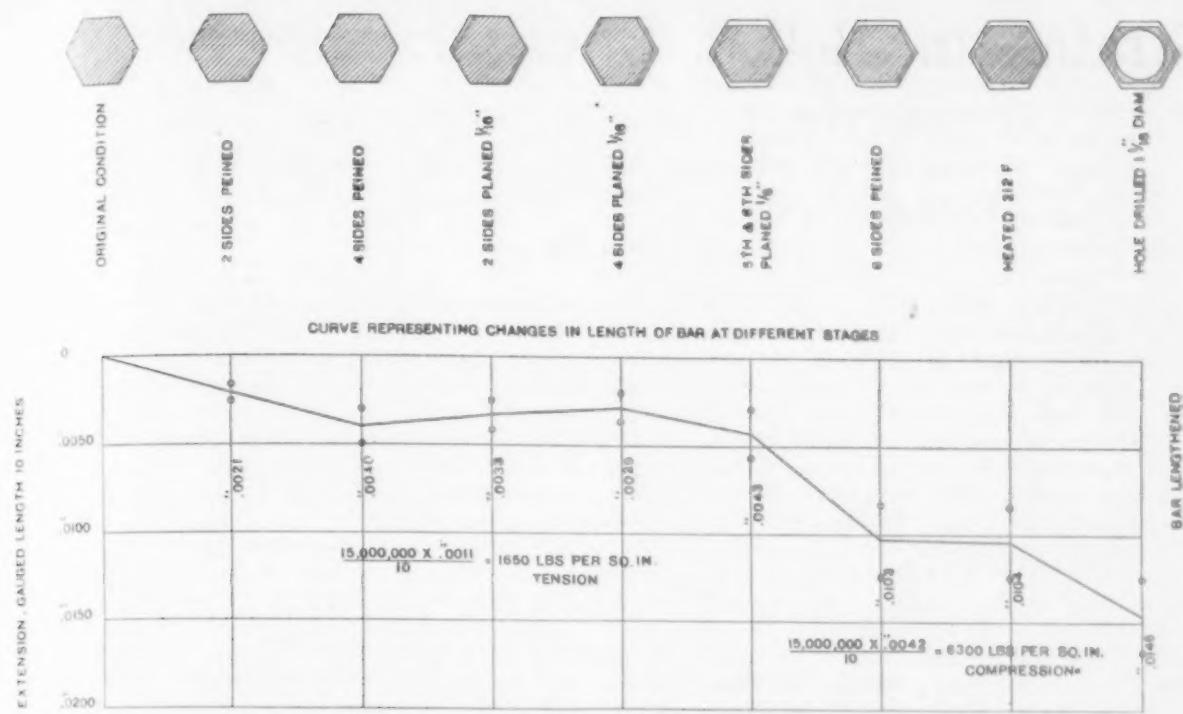


Fig. 3—Results of Tests on a Rolled Brass 1 1/2 In. Hexagon Bar

at each of which a decrease in length occurred. The total range in the recovery of the bar corresponded to a stress of 11,526 lb. per sq. in. in the metal at the center of the bar, which was finally turned down to 11/16 in. dia. The strains of extension resulting from peining corresponded to a stress of 5053 lb. per sq. in., while those attributed to rolling during the process of manufacture were equivalent to a stress of 6316 lb. per sq. in.

The results of tests upon phosphor bronze are represented by Fig. 4. In the first stages of the test the bar was peined, and as usual, it caused an extension in length. When turned down 1/8 in. dia. the recovery corresponded to a stress of 4105 lb. per sq. in., which was of tension in the metal remaining in the bar. There was some modification given the treatment of this bar over the

previous ones. At an intermediate stage it was peined on one side only, that is, half the cylindrical surface at side A was peined; the other side remaining unhammersed for the time being. This resulted in the extension of the metal on one side and a contraction on the other. It behaved in a manner similar to a bent beam, but with a change doubtless in the position of the neutral axis.

The total range in stress on the opposite sides of the bar at this time was equivalent to 10,895 lb. per sq. in., a considerable range in stress to exist in the same bar, but nevertheless not believed to be greater than frequently witnessed in hard rolled metal not affected by peining. The recovery in length between the stage at which the whole cylindrical surface was peined and when finally turned down to 5/8 in. dia. represented a stress of 6316 lb.

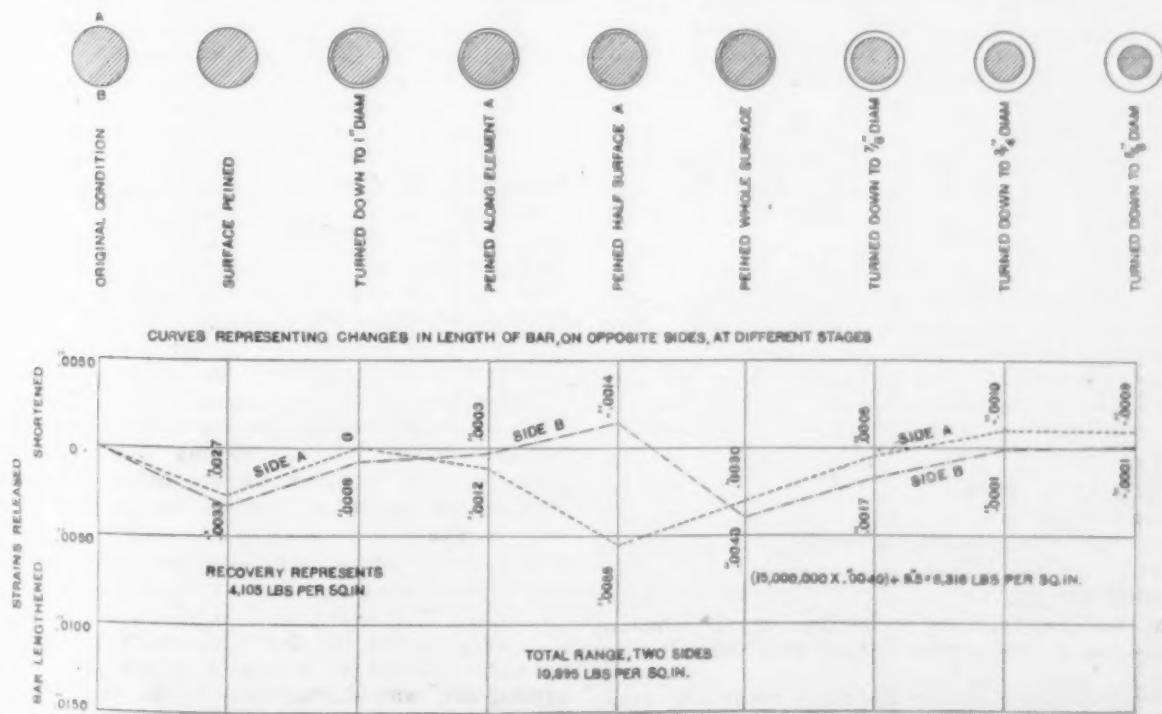


Fig. 4.—Results of Tests on a Phosphor Bronze Bar, 1 1/4 In. Diameter.

per sq. in., which was of tension in the metal at the middle part of its cross section.

On three rolled bars of yellow brass, two of which were subjected to no other treatment than the machining required to turn down and bore out the first and second respectively, the strains were released. They represent therefor only those which were introduced into the metal by the process of manufacture of the bars. The first bar was turned down from  $1\frac{1}{4}$  in. to  $1\frac{1}{16}$  in. dia. The strains released corresponded to a stress of 2605 lb. per sq. in. tension in the metal of the core. According to the relative areas of the core and the annulus, the latter had been under an initial stress of compression of 6779 lb. per sq. in. The second bar, from another lot of metal, was bored out to  $1\frac{1}{16}$  in. dia., leaving an annulus  $3/32$  in. thick. The strains in this annulus corresponded to a stress of 9900 lb. per sq. in. compression. According to relative areas the metal of the core had been under an initial stress of 3803 lb. per sq. in. tension. The third bar was turned down and peined and then bored out to a thickness of  $5/32$  in. The compressive strains in the annulus were equivalent to 12,000 lb. per sq. in. stress. According to the measured and estimated strains in the annuli and cores of the untreated bars, rolled brass bars may have present, due to processes of manufacture, internal strains of opposite directions amounting to 13,000 lb. per sq. in.

The behavior of a copper bar was similar to that witnessed in the brass and bronze bars. In fact the metal moved about in substantially the same manner as the brasses and bronzes.

In the case of bent brass bars the internal strains which exist in such bars at the bends, beginning on the convex side, are first compression, then tension, then passing across the primitive neutral axis of the bar, then

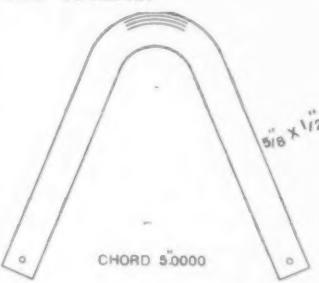


DIAGRAM REPRESENTING MOVEMENTS OF LEGS OF BENT BAR SHOWN BY CHORD MEASUREMENTS AT DIFFERENT STAGES  
THICKNESS AT BEND REDUCED BY PLANING FROM CONVEX SIDE

CHORD MEASUREMENTS

ORIGINAL	5.0000
1/16 REDUCTION	5.0064
1/8 ..	5.0096
3/16 ..	5.0134
1/4 ..	5.0133
5/16 ..	5.0025
3/8 ..	4.9607
7/16 ..	4.9525
1/2 ..	4.9520
9/16 ..	4.9578

SUPPLEMENTARY TESTS

ANNEALED AT  $1040^{\circ}\text{F}$ . REDUCED AT BEND ON CONVEX SIDE  
PEINED AT BEND, CONCAVE SIDE. REDUCED ON SAME SIDE

Fig. 5—Results of Tests on a Copper Bending Bar

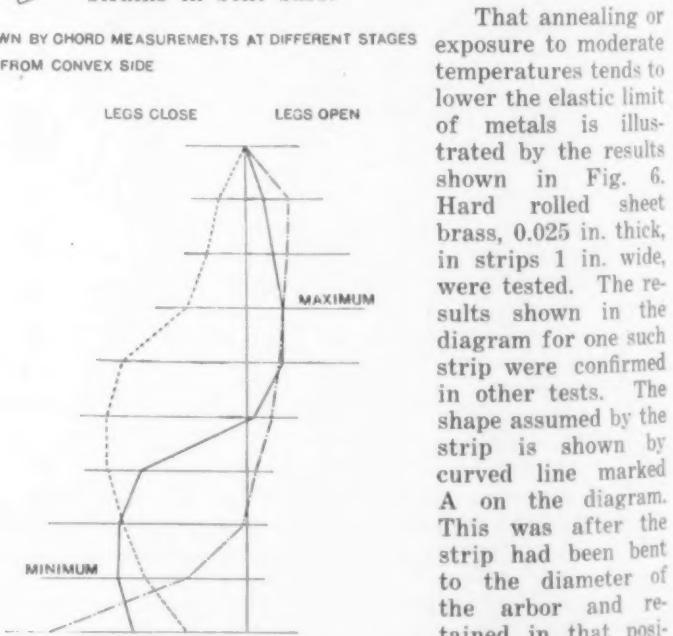
compression and finally, at the inside of the bend, there is tension. With this explanation of the arrangement of the internal strains, it will be under-

stood why the legs of the bent bars move in an outward direction when the metal at the bend is reduced in thickness, it being immaterial whether the metal is planed off the convex or concave side of the bend. Later on, when the thickness is further reduced, the direction in which the legs move changes and they move inward and after reaching a minimum distance apart finally turn and again move outward.

The normal behavior of a bent copper bar is the same as that of steel or brass. The full line of the curve shown in Fig. 5 illustrates the movements of the legs of a copper bar. Internal strains can be dislodged by annealing the metal or they may be disturbed and very decidedly changed by introducing other conflicting internal strains. Two additional curves are shown on this diagram, one illustrating the effect of annealing a second copper bar, the other the effect of peining the concave side of the bend of a third bar. The annealing process removed certain of the internal strains as shown by the curve of the diagram.

The physical properties of metals change with increase in temperature. A lowering of the elastic limit usually characterizes the result of exposure to higher temperatures. It follows that the gradual elimination of internal strains would, in general, progress as the elastic limit is lowered by increase of temperature; that is, that internal strains representing stresses above the elastic limit at given temperatures would be effaced.

The curved line of the diagram representing the peined bar shows that overcoming the initial strains of tension on the concave side of the bent bar had their expected result, and a reduction in thickness of the bar was not attended by an outward movement of the legs. An inward movement occurred at the very start and continued until the influence of the peined metal was lost by reason of its removal. The introduction of compressive strains at the concave side of the bend by peining, shown by the present test, is in confirmation of the explanation given of the arrangement of internal strains in bent bars.



That annealing or exposure to moderate temperatures tends to lower the elastic limit of metals is illustrated by the results shown in Fig. 6. Hard rolled sheet brass, 0.025 in. thick, in strips 1 in. wide, were tested. The results shown in the diagram for one such strip were confirmed in other tests. The shape assumed by the strip is shown by curved line marked A on the diagram. This was after the strip had been bent to the diameter of the arbor and retained in that position for several hours. It was then returned to the arbor, over which it was seized and raised in a water bath to a temperature of 150 deg. F. This accomplished a noticeable annealing of the brass as indicated by

the reduction in the chord measurement which changed from 9.95 in. to 9.62 in., indicating a loss of 0.33 in. Exposure under similar conditions of restraint to the temperature of boiling water resulted in a further loss in chord measurement, the loss then being 0.92 in.

Finally the brass strip was reheated in boiling

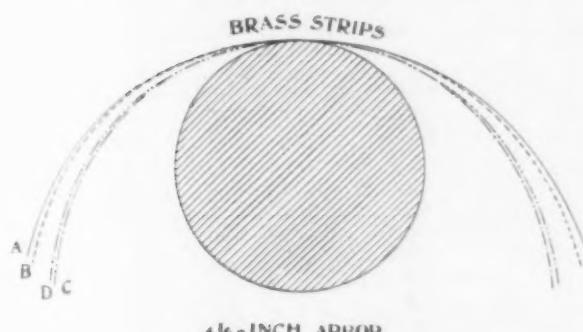


Fig. 6—Partial Annealing of Sheet Brass at Moderate Temperatures. Hard Rolled Sheet Brass, 0.025 in. Thick, Seized Over a 4 1/4 in. Arbor and Heated to Temperatures of 150 and 212 Deg. F., Released and Changes in Length of Chord Measured at Successive Stages.  
 A. Shape Strip Assumed after Having Been Seized Over a Cord Arbor—Chord 9.95 in.  
 B. Shape Strip Assumed after Exposure at 150 Deg. F.—Chord 9.62 in.; Loss 0.33 in.  
 C. Shape Strip Assumed after Exposure at 212 Deg. F.—Chord 8.70 in.; Loss, 0.92 in.  
 D. Shape Strip Assumed after Exposure at 212 Deg. F. in a Free State, Not on Arbor—Chord 8.86 in.; Gain, 0.16 in.

water, in an unconfined condition, whereupon there was a slight recovery in the chord measurement, a gain of 0.16 in. being noted. This final change, a minute one it must be in the cross-section of the sheet, again suggests that a very slight shift occurs under treatment in the position of the neutral axis of the sheet, regarded as a beam. This test, in its general results, demonstrated that some reduction in the elastic limit of the metal is effected by exposure to a very moderate rise in temperature above atmospheric.

#### CONCLUSIONS

Briefly summarizing the results of these tests, it appears that cold rolling introduces into brass and bronze bars opposing strains of tension and compression of considerable magnitude.

That annealing will relieve these internal strains.

That the presence of opposing strains of tension and compression in the same bar tends to cause early permanent sets when the metal is loaded, it being immaterial whether the applied load is one of tension or compression.

That the vagueness of an elastic limit in brass and bronze is accentuated by these conflicting strains.

That high elastic properties in either tensile or compressive directions require previous overstraining loads directly applied in the directions such gains are desired.

That no mechanical method capable of raising the elastic limits in both tensile and compression directions is apparent in the present tests.

That exposure to very moderate temperatures causes an appreciable annealing effect, and consequent lowering of the elastic limit of the metal.

Mr. Howard states that the work described above precedes similar tests on castings; that it is futile to attempt to impart high elastic properties in both tensile and compression directions by mechanical treatment of bronze; that internal strains of such magnitude are introduced of opposite kinds by cold rolling or drawing that in whichever di-

rection a subsequent face is applied it will augment one of the internal forces and early permanent sets will result; also that the control of strains in bent bars is of interest and that brass follows along in the same manner as steel in that respect.

#### The Jones "Step" Process at Date

In the April 24 issue of the Marquette (Mich.) Chronicle space is given to an extravagant article announcing the perfection of an iron smelting process that will revolutionize industry and make Marquette tremendously important as a steel manufacturing center.

The process referred to is that upon which John T. Jones, Iron Mountain, Mich., has been experimenting for a number of years. It is now claimed that it has reached another stage in its development where success is assured. Attention is called here to the above article, not so much because the statements made are extravagant, for that is the usual style of treating similar propositions in local papers, but because of the unaccountable persistence with which this project is pursued.

On Dec. 14, 1911, *The Iron Age* referred to the Jones process for metallizing ore, in part as follows:

The conclusions available from what has been demonstrated by the "step" process thus far, as regards iron ores, are reasonably obvious. An apparatus has been devised for isolating the operations and reactions occurring in the upper zones of the blast furnace and recovering the product at that stage. The cost of so doing corresponds approximately to the cost of the incomplete blast furnace operations. The perfection of this apparatus mechanically, to provide for the handling of this product in quantity, should be comparatively simple. If the cost of the process could be brought sufficiently low to permit of handling the metallized product in competition with high grade ores, a large field might be presented for the output of the "step" process as raw material for the blast furnace. Thus far the practical operation of the process, with the exception of the one cupola experiment mentioned above, seems to have been confined to the metallizing of the oxide. Concerning the operations necessary to incorporating in the metallized ore those ingredients desirable in pig iron (either for foundry purposes or for supplying heat and other proper conditions in the making of steel) and the facilities required for controlling the analysis of the iron, no definite substitute appears to have been offered for the work performed in the boshes and crucible of the blast furnace.

Since the above comment was made there has not been, to the best of our knowledge, any essential change made in the process, though the form of apparatus used has been improved and now more nearly approaches regular blast furnace construction.

The Rutland Foundry & Machine Company, Bennington, Vt., a corporation organized for the purpose of manufacturing hoisting machines, pumping machinery, wood-working machinery and a full line of power transmission machinery, has taken over the machine shop of the late Olin Scott, who for many years was engaged there in the manufacture of pulp-mill and powder-mill machinery. The new company, in addition to its own line of work enumerated above, expects to continue to build the machinery for which a wide reputation was established by Mr. Scott.

The Buffalo Foundry & Machine Company, Buffalo, N. Y., announces that it has terminated the arrangement whereby H. E. Jacoby has been its representative in New York City and vicinity. The company is now handling direct all inquiries covering vacuum apparatus, mastings, patterns and machine work.

# Dynamic Properties of Steel Castings

## Results of Impact Tests of High and Low Carbon and Alloy Steels Used in Locomotive Frames

BY EDWIN F. CONE

The importance of learning something more about steel than its static properties has increased in recent years. In determining its value dependence has been placed entirely on knowing its tensile strength, elastic limit, elongation and reduction of area. But the severer demands made on steel lately, especially as regards its endurance under shock and intermittent vibrations, has necessitated a means of estimating its ability to withstand such conditions in service. Also the increased use of alloying metals, such as vanadium, titanium, etc., which are heralded as "anti-fatigue medicines for steel," has added to this necessity in order to put a value on their claims. The ordinary static machines do not supply this knowledge, and so recently various others have been placed at the disposal of the metallurgist to estimate the dynamic properties of steel. Some of these depend on subjecting the specimen to repeated shocks and others to alternating impacts, but the net result in each case is supposed to be the same.

The increased use of steel castings in locomotives and automobiles has necessitated a steel of increasingly better quality. Attempts to achieve this have been made by improvements in heat treatment or in the use of the new alloys. Particularly in locomotives the increased superstructure of the larger modern engines has placed a heavier burden on the dynamic or shock-resisting properties of the locomotive frame in particular. To meet these conditions various steels have been incorporated in these frames, the most prominent of which are: Ordinary carbon steel, high or forty-carbon steel, nickel steel and vanadium steel. These are usually subjected to an annealing process which consists in bringing them to the recalcitrance point, allowing them to soak at this temperature for a sufficient time and then cool slowly in the closed annealer. Attempts to subject them to any different treatment have not thus far resulted in improving the value of the frame, and the foregoing practice is practically universal. The efforts of the Pennsylvania Railroad to increase the strength and value of a frame by a special heat treatment are an exception to this statement, but the results whether good or bad have not yet been made public.

In a foundry where from time to time locomotive frames of each one of these grades of steel, except the nickel, were made, the writer obtained specimens which he subjected to tests on a Landgraf-Turner alternating impact machine in order to determine if possible their relative merits dynamically. So far as was possible the test pieces were taken from coupons of as near the same character and location on locomotive frames as was feasible, except in the case of nickel steel, the tests for this coming from representative nickel steel castings. All of the coupons received as near the same heat treatment as possible, remaining in almost every case on the casting while it was being commercially annealed. They were, of course, not all annealed at the same time, but the treatment was of the slow cooling character and uniform.

Tables 1, 2, 3, and 4 show the results in each case as well as the composition, the steel being made in acid open-hearth furnaces:

Table 1—Dynamic Tests of Vanadium Cast Steel

Heat	No. of tests made	Average impacts	Carbon, per cent.	Manganese, per cent.	Silicon, per cent.	Vanadium, per cent.
1	10	1837	0.29	0.62	0.289	0.22
2	3	2097	0.33	0.58	0.254	0.19
3	1	2520	0.26	0.60	0.235	0.19
4	3	2497	0.24	0.60	0.280	0.21
5	4	1601	0.31	0.63	0.310	0.19
6	4	2608	0.31	0.70	0.282	0.20
7	4	2680	0.28	0.65	0.240	0.21
8	4	1780	0.34	0.64	0.231	0.161
9	3	2547	0.25	0.57	0.240	0.20
10	6	2545	0.26	0.69	0.238	0.195
11	4	2281	0.25	0.66	0.291	0.247
12	4	2172	0.25	0.65	0.263	0.209
13	3	1906	0.25	0.63	0.268	0.202
14	4	2118	0.32	0.73	0.262	0.207
15	3	2090	0.26	0.58	0.251	0.198
16	3	3105	0.35	0.73	0.319	0.240
17	4	2348	0.24	0.59	0.293	0.184
18	4	1956	0.31	0.60	0.252	0.209
19	3	1419	0.30	0.61	0.277	0.175
20	4	2644	0.27	0.74	0.242	0.208
21	4	2725	0.31	0.71	0.282	0.211
22	3	1820	0.31	0.65	0.296	0.209
23	4	2762	0.30	0.71	0.314	0.160
24	4	2434	0.29	0.62	0.258	0.161
25	2	2323	0.27	0.67	0.291	0.190
26	3	2665	0.30	0.71	0.275	0.179
27	3	2119	0.26	0.59	0.238	0.204
28	5	2395	0.32	0.70	0.260	0.260
29	3	1943	0.26	0.60	0.235	0.235
30	4	2182	0.32	0.65	0.301	0.301
31	3	1524	0.28	0.62	0.303	0.303

Table 2—Dynamic Tests of Nickel Cast Steel

Heat	No. of tests made	Average impacts	Carbon, per cent.	Manganese, per cent.	Silicon, per cent.	Nickel, per cent.
32	2	2767	0.35	0.70	0.301	3.47
33	2	2517	0.30	0.68	0.336	3.48
34	2	2838	0.30	0.85	0.318	3.55
35	10	2369	0.33	0.71	0.294	3.56
36	10	2570	0.38	0.68	0.273	3.38

Table 3—Dynamic Tests of Ordinary Carbon Cast Steel

Heat	No. of tests made	Average impacts	Carbon, per cent.	Manganese, per cent.	Silicon, per cent.
37	4	2536	0.30	0.68	0.277
38	2	1915	0.27	0.74	0.241
39	4	2719	0.25	0.65	0.244
40	3	2279	0.28	0.63	0.275
41	4	1910	0.23	0.69	0.235
42	3	2572	0.32	0.72	0.294
43	3	2105	0.31	0.69	0.317
44	3	1555	0.28	0.62	0.265
45	6	2990	0.25	0.68	0.259
46	2	2523	0.30	0.70	0.292
47	3	2757	0.35	0.69	0.233
48	4	1889	0.25	0.67	0.256
49	4	3036	0.24	0.68	0.268

Table 4—Dynamic Tests of High Carbon Cast Steel

Heat	No. of tests made	Average impacts	Carbon, per cent.	Manganese, per cent.	Silicon, per cent.
50	2	3202	0.40	0.79	0.317
51	4	3268	0.35	0.70	0.240
52	4	2922	0.41	0.72	0.235

Averaging and recapitulating these tests we have the following arranged in order:

No. of tests made	Average of all impacts
1. Forty carbon steel.....	16 313°
2. Nickel steel .....	26 261°
3. Ordinary carbon steel.....	45 286°
4. Vanadium steel .....	116 224°

It must be admitted that these results are not conclusive, but they are of value so far as they go. An equal number of tests from each grade of steel would have been desirable, but this was impossible at the time. The tests do show, in a measure, the relative dynamic superiority of various grades of cast steel in the condition in which they are used commercially and practically, but it is not demonstrated that one steel is in itself essentially superior to another. In other words, too much stress cannot be placed on tests of this character. They should be used in conjunction with other tests, such as the static, in placing a value on steel. It is possible that a different rating would have been secured

if the annealing of the test coupon had been done in an electric furnace, but the value of the results from a practical point of view would not have been so great. In any case these tests are the first of the kind that have been made public.

It is interesting to state here that of the 31 vanadium heats tested dynamically, some were made by adding the ferrovanadium in the furnace bath and some by putting the alloy in the ladle as the heat was tapped. There is a difference of opinion as to the relative effect of these two practices on the quality of the steel. A record was kept of each heat in this case. A comparison as to dynamic results is shown in the following table:

Heats	Average impacts
Alloy in the bath.....	11 2033
Alloy in the ladle.....	26 2273

The chemical composition seemed to have no definite effect, some of the high and low vanadium heats having exceptionally good and poor results equally. Since these tests were made it has been found, by tests made by the writer, that low carbon vanadium steel is decidedly better dynamically than the steel shown in table 1 having a carbon content of 0.25 to 0.35 per cent. A vanadium steel of 0.20 to 0.22 per cent. carbon and as near 0.60 per cent. manganese as possible gave 2693 alternating impacts, which would place it almost at the top in the table of superiority. Without doubt low carbon and low manganese vanadium steel for castings insures decidedly better dynamic and static properties than any other vanadium composition.

The dynamic tests here tabulated refer to commercially annealed castings by the slow cooling process which always gives rise to a microstructure of a more or less coarse nature as compared with that obtained from quick cooling (air tempering) and from special quenching and drawing. These always insure a fine microstructure and it is claimed that the dynamic properties are much better from such treatment. A comparison of these various steels, heat-treated by these other two methods, would prove interesting and valuable, and might result in an entirely different tabulation as to superiority.

It is interesting to note that if the elastic ratio of each steel is taken into account, the vanadium and nickel steels would be placed on an equal rating, each having an elastic limit at least 60 per cent. of the tensile strength, whereas the other three grades do not average 52 per cent. in elastic ratio. Reports from frames in actual service are that the vanadium is stronger dynamically and statically, as would also be the nickel, than any others in use.

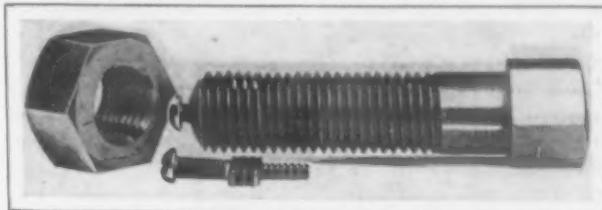
#### Johnson Electric Smelting, Incorporated

The Johnson Electrothermic process, developed by W. McA. Johnson at the plant of the Continuous Zinc Furnace Company, Hartford, Conn., has already been described in these columns and data have been given indicating its commercial success. It is expected that the process will shortly be worked in 10-ton electric furnaces. Recently the Johnson Electric Smelting, Inc., has been organized and it controls the American rights for the Johnson process. The company's offices are at 18 East Forty-first street, New York. Byron E. Eldred is president; W. McA. Johnson, first vice-president; Joseph Struthers, second vice-president; W. H. Howells, secretary, and P. R. Mallory, treasurer.

The Cleveland Foundry Company, Cleveland, Ohio, has placed in operation its new plant at Sarnia, Ontario. This will be operated under the name of the Perfection Stove Company, Ltd., and will supply the Canadian trade. The plant will be under the management of R. E. Jones, who has been assistant superintendent of the Cleveland plant.

#### A Recently Developed Type of Nut Lock

A nut lock employing the broken thread principle has been developed by Schum Brothers, Metropolitan Tower, New York City. The construction of the nut is simple and it will lock automatically, with a slight turn. The nut lock consists of three parts, a spring, a movable section and a set screw. As will be noted, there are four broached places in the nut, and this is what causes the locking of the nut on the bolt. The movable portion of the lock



An Improved Type of Nut Lock in Which the Broken Thread Principle Is Utilized

is inserted in a hole in the bolt, and the threads upon it are normally kept out of alignment by the spring. When it is desired to lock a nut on the bolt, the threads on both of the portions must be in alignment. If this is not the case, the set screw is turned to compress the spring and bring the threads in line after which the nut is turned until it is over the movable portion of the thread on the bolt. The set screw is then turned until the pressure on the spring is relieved and the threads have been thrown out of alignment, after which it is removed to prevent tampering by unauthorized persons. An additional precaution would be the tapping of the thread out of standard, or filling the hole in the end of the bolt with some composition.

If the nut should not be absolutely locked in position at the time the set screw is taken out, it is emphasized that any vibration to which the nut might be subjected would tend to lock it in position, as if the nut moved under the influence of this vibration to come off the bolt it will only turn a short way before one of the broached places comes over the movable portion of the bolt. If through inadvertence the set screw is not removed, the nut, it is claimed, cannot come off under the influence of vibration, as the set screw probably would be jarred loose and fall out before anything happened to the nut, while any movement of the latter would only result in its locking, the locking or unlocking being indicated by a click.

One of the special points about the lock, upon which emphasis is laid, is that none of the locking parts are exposed to the elements, but are completely protected by the nut.

#### German Exports in March

German exports of iron and steel in March and for three months ended with March compare as follows in leading lines with last year's movement, the quantities given being metric tons:

	March	Jan.-March
Pig iron .....	1913	1914
Scrap .....	84,182	68,142
Semi-finished steel .....	19,320	15,666
Beams .....	57,321	61,285
Other shapes .....	35,031	32,502
Heavy plates .....	90,511	109,721
Light plates .....	40,984	43,701
Wire, rolled or drawn, not polished .....	15,388	14,269
Wire, rolled or drawn, polished .....	30,307	30,131
Wire nails .....	5,851	7,119
Tubes .....	28,629	12,395
Steel rails .....	41,838	43,534
Ties and fish-plates .....	10,759	15,466
		80,554
		45,171

# An Iron and Brass Foundry for Chicago

## General Arrangement and Equipment of the First Unit of a Group of Municipal Shops for Making for the City Certain Supplies

The City of Chicago recently placed contracts for the building of a municipal iron and brass foundry. It was first intended that this foundry be added to an existing machine shop which the city operates. Subsequently a new tract of land was purchased at Ashland avenue and the south branch of the Chicago River, on which it is proposed to build an entirely new group of municipal shops, of which the first unit will be this foundry, to be followed by a machine shop and storage buildings.

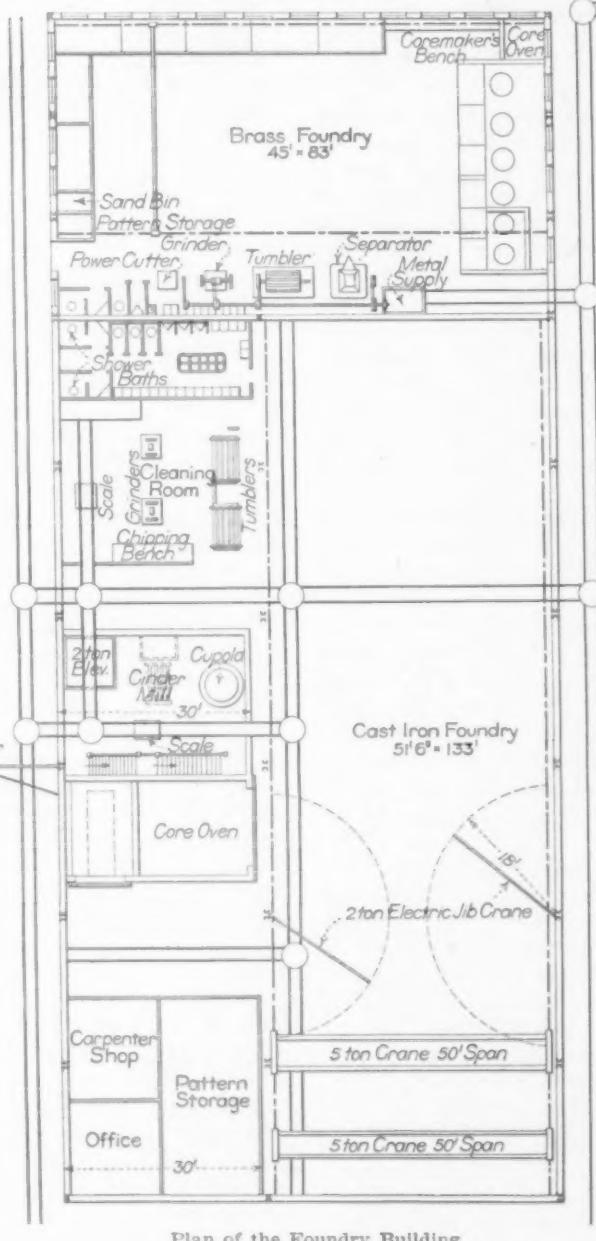
Special interest has attached to the municipal foundry as a result of the action taken by the Chicago Foundrymen's Association in protesting against this undertaking by the city. It was maintained that the work required by the city could be produced much more cheaply by securing it from a commercial foundry on contract. The objections raised, however meritorious, came too late and the city is proceeding with the plan of building its own foundry.

A general drawing of the layout of this foundry is presented in the accompanying illustration. The building will be 178 ft. long and 83 ft. wide, of which one end, 45 x 83 ft., will be occupied by the brass foundry. The general arrangement is apparent from the drawing without the need of

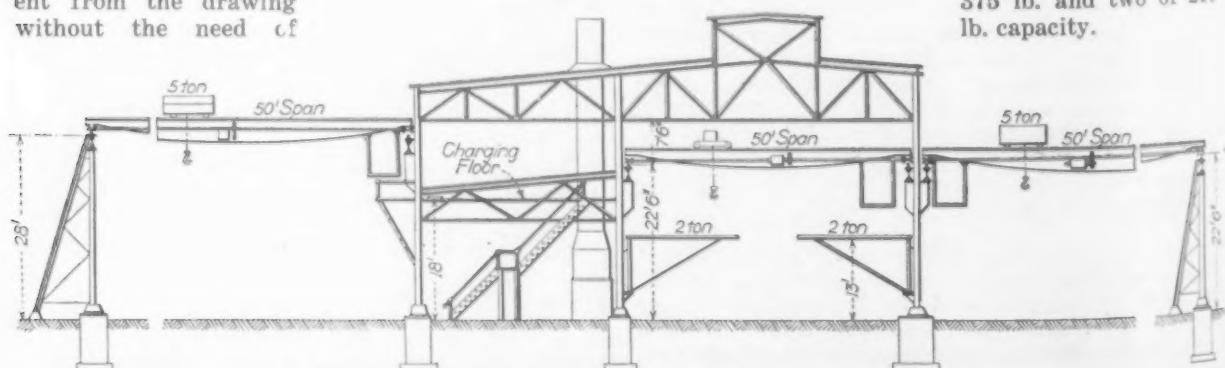
much additional explanation. It is the intention to install a No. 6 cupola. Raw materials for charging will be handled to the charging floor by a 2-ton electric elevator, and in addition the charging floor

will extend out from the building in the form of a landing platform. The 5-ton stock yard crane of 50-ft. span, which serves the storage space paralleling the building on one side will thus be available for placing materials directly from the yard up upon the charging floor. A similar crane on the other side of the foundry spans the flask yard.

The main foundry floor, 51 ft. 6 in. x 133 ft., will be spanned by two 5-ton cranes and will be supplemented by 2-ton jib cranes for such sections of the floor as require auxiliary service. Industrial tracks reach all parts of the foundry. For such portions of the city's work as can be handled to advantage in that manner, molding machines are to be installed. Examples of the work that can be machine molded are the sewer covers, of which a round tonnage is required every year. Of the other work, the amount and variety is such that it will probably be a matter of hand molding. The brass furnace will have two heating pits and will also be equipped with four oil or gas-burning tilting furnaces, two of 375 lb. and two of 210 lb. capacity.

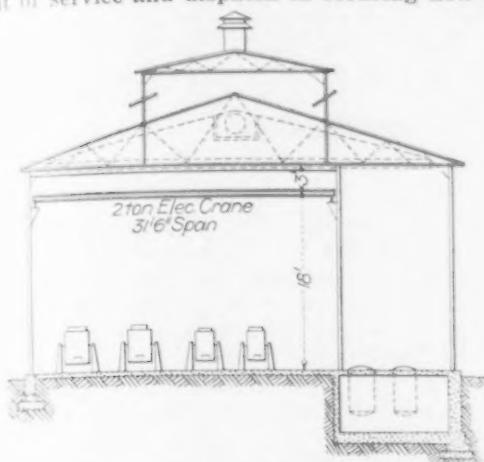


Plan of the Foundry Building



Cross-Section of the Foundry and the Craneways on Each Side

A very substantial building is to be erected and it is the anticipation of the city officials that in point of service and dispatch in securing new cast-



Cross-Section of Brass Foundry Department

ings, particularly in cases of urgent repair, this foundry will prove of sufficient benefit to justify its erection.

#### Electric Steel Castings in England

Discussing the demand in England for small steel castings, an engineering correspondent of the London Times says that the growing use of these is largely attributable to the rapid growth of the motor trade. While three years ago about 2000 tons per month of such castings were imported into England from the continent, at present it is safe to say that the monthly importation amounts to 8000 tons. These castings are made in electric furnaces and continental foundries, he reports, are extremely busy at present. In Switzerland a foundry, started a few years ago on a very modest scale, now employs over 2000 men, producing almost entirely castings for the motor trade, the output of cast steel motor-vehicle wheels being alone very large. The molding is also of a very high order.

In explaining the lack of attention paid to this part of the foundry business in England he says the experience in electric furnace operation there has been disappointing, at least that of companies producing only castings by this method. Foundry managers there, he adds, are without the experience necessary for the successful operation of electric furnaces. It is his opinion that, with the cheap current available in the north of England, a foundry operating such furnaces of one to three tons capacity could be made to pay and compete with continental foundries.

#### Highest Power Locomotive

The most powerful locomotive unit yet built has recently been completed for the Erie Railroad by the Baldwin Locomotive Works. It develops a tractive force of 160,000 lb., accomplished by placing eight of the 24 63-in. driving wheels under the tender, making the weight of the latter available for adhesion. The locomotive is built after patents granted to George R. Henderson, consulting engineer, Baldwin Locomotive Works. The frames are vanadium steel castings of the unusual width of 6 in. The engine excels in efficiency for slow, heavy work, measured largely by the proportion of the total weight available for adhesion, 90 per cent. being in this case carried on the driving wheels as against 65 per cent. in a large Mallet. The total weight of the engine is 830,000 lb., of which 743,000 lb. is on all the driving wheels.

Manganese, as affecting the corrosion of steel, does not have a distinct influence, according to Dr. Cecil H. Desch and Samuel Whyte, who gave the results of their experiments in a paper before the West of Scotland Iron and Steel Institute. They report indications that the mechanism of the process of corrosion is modified by the presence of manganese and that this may influence the course of corrosion on a large scale.

## SUCCESSFUL PROFIT SHARING

#### The Plan Instituted by the Clipper Belt Lacer Company, Grand Rapids, Mich.

On Christmas Eve, 1912, Charles P. Foote, president of the Clipper Belt Lacer Company, Grand Rapids, Mich., announced a profit sharing plan. A year previous the plan was first tried out in the hook carding department. The girls at that time were assured that all increased earnings would be theirs and that the piece rate would not be lowered, no matter how much they made. The result of the experiment was that the girls from earning their former wage of \$7.50 a week increased their earnings to a point where the more skilled operatives were making \$12 to \$15 a week and the less skilled averaged a little over \$10. The output per operative was increased nearly 50 per cent., thus reducing the overhead cost to the management, in spite of the great increase in wages paid.

Encouraged by this experiment, the company announced through F. A. Stone, the secretary-treasurer of the company, in a general Christmas letter that "all who at the end of 1913 have been with the company one year or less will receive five per cent. in cash of the amount they have been paid during the year. All who have been two years in our employ, six per cent.; three years, seven per cent., and so on, one per cent. added each year, until the amount has reached 10 per cent., where it will remain indefinitely, provided the profits of each year warrant it. A nine-hour working day will be established, with Saturday half holidays without a reduction in pay."

On closing the books for 1913 it was discovered that over \$3000 were available for distribution under the plan outlined, one stenographer and one drayman earning the maximum 10 per cent. dividend. The dividends were placed in the pay envelopes Christmas Eve, 1913, with a little note expressing the gratification of the company that the amount was as large as it proved to be, and expressing the hope of still better things in the year to come. The good will that this distribution engendered was an inspiration to the management and many incidents came to their notice where this Christmas present helped an employee over serious trouble. Early in January the cottage occupied by one of the girls in the hook department was totally destroyed by fire, not even the furniture or household effects being saved. She and her mother had never felt they could afford to carry insurance while making payments on the home, but when the Christmas check came they decided that insurance on both the home and contents would be the very best use they could put it to. The fact that they were insured was, therefore, wholly due to this timely sharing of the year's profits.

Outside of the indirect benefit of a closer bond of fellowship with their employees, the direct results of the profit sharing plan were as follows:

The yearly output was nearly doubled, with only a slight increase in force.

Cost of the Clipper belt lacer was reduced 9 per cent., in spite of the fact that the men making it increased their earnings 20 per cent.

The output of one important piece for which 20 cents is being paid on piece work was so greatly increased that, figured on the former daily wage basis, it would have cost only 11 cents labor per piece.

Figuring all departments, the average gain to operatives was 19 per cent., and the average direct gain to the company nearly 9 per cent.

# Standardizing Motors for Machine Tools\*

## A Classification of Electric Motors Suitable for Machine Driving and the Mechanical and Electrical Points Needing Consideration

BY CHARLES FAIR†

This paper is not written so much with the idea actually of settling at this time the question of standardization of motor dimensions and speeds for machine tools, as it is with the idea of pointing out a method which if followed should accomplish much toward the standardization desired. Certain of the dimensions and speeds once standardized will result beneficially not only to the machine manufacturer but to the motor manufacturer and to the machine user as well. The importance of motor driven tools has now reached such proportions as to warrant most serious consideration of this subject.

There will, of course, always be demands for odd combinations of speeds and requirements, and these it would be useless to attempt to standardize, but by far the majority of cases could be standardized

For the past five or six years attempts have been made to standardize certain dimensions and speeds for machine tool motors, but these attempts have failed for various reasons. It would be of little use to analyze those past failures. Unquestionably there should be first of all a better understanding on the part of the machine manufacturer and the motor manufacturer of each other's difficulties, and much work is essential before material progress along the line of standardization can be accomplished. With this in mind, I have prepared an outline which I think fairly presents the situation from the viewpoint of both sides and which must be considered if real progress or results are to be obtained.

It could not be expected that the electrical manufacturers would change existing standards of motor

### Outline to Assist in Standardizing Electric Motors for Machine Tools

SPEEDS	Constant	AC	Full load	Cycles	Squirrel cage	High torque	Gear	Involute	Steel									
					Phase	Normal tor.												
	Variable	Synchronous	Voltage	Slip ring	Internal resistance		Herringbone	Rawhide										
	DC	Full load	Voltage	Shunt	Compound <sup>3</sup>		Shafts	Bevel, worm	thrust									
	Light load			Compound <sup>3</sup>	Series <sup>2</sup>													
	Shunt						Shafts											
	DC	Voltage					Shafts											
	Adjustable						Shafts											
	Variable		Brush shifting		Shunt characteristics		Shafts											
	AC	Multi-speed			Series <sup>2</sup>		Shafts											
	AC	Multi-speed			Constant horsepower		Shafts											
	Slip ring				Constant torque		Shafts											
					Multi-speed <sup>4,5</sup>		Shafts											
FRAME							Shafts											
DRIVE							Shafts											
Gears							Shafts											
GENERAL							Shafts											
1. Adjustable speed motors. Infinite number of fixed speeds within their speed range.																		
2. Variable speed motors—speed varies with the load: <small>series</small> compound <small>slip ring</small>																		
3. Compound wound motor—speed varies with the load and proportion of <small>series</small> and shunt winding.																		
4. Slip ring motor—if resistance is left in circuit speed varies with load and resistance.																		
5. Multi-speed motors. A limited number of fixed speeds, seldom more than four as 600/900/1200/1800.																		

under a heading that for convenience might be known as normal, and our efforts should be bent toward standardizing these speeds and dimensions.

For years and under generally adverse circumstances, much progress has been made in standardizing certain machine parts. For a long time it has been recognized as desirable, at least on the part of a number of the machine tool builders, that something be done toward standardizing certain motor dimensions, speeds, etc., for machine tool drives.

\*Paper read before the National Machine Tool Builders' Association, Worcester, Mass., April 23.

†General Electric Company, Schenectady, N. Y.

dimensions or speeds, nor do I believe it would be either desirable or practicable to do so on account of the confusion that would result, but I see no reason why, if the machine manufacturer in conjunction with the motor manufacturer will give the subject the consideration it warrants, and do their part toward bringing about a better understanding of what is really desirable in the way of speeds and dimensions, why the motor manufacturer in turn cannot incorporate, at least in part, some of the dimensions and the speeds when bringing out new lines of motors. Obviously it would be just as impossible for the various motor manufacturers to

design their motors to a single set of dimensions as it would be for the machine manufacturers to design their machines to a single set of dimensions. Notwithstanding this, however, much can be done to improve the situation. The American Society of Mechanical Engineers through its secretary, Mr. Rice, has offered to co-operate.

For the sake of convenience I have divided the outline into five parts—namely, speeds, shafts, frame, method of drive and general.

#### SPEEDS OF MOTORS

There is an almost endless number of constant, adjustable and variable speed combinations available, but from this great variety certain speeds should become the logical ones for the majority of drives. The direct-current, constant-speed shunt motor speed, for instance, should logically be that of the alternating current, 60-cycle motor. Alternating-current and direct-current motor speed should be given in terms of full load or else in terms of both no load and full load. It is, of course, understood that the cycles fix the alternating current speeds, except as modified by slip, etc. Adjustable speed motors would naturally be higher in speed on the highest speed than a constant speed motor, because the adjustable speed motor would only run a certain percentage of the time at high speed. Adjustable speed motors are nearly always geared, and their speeds should be governed by a proper gear speed.

There should be little difficulty in arriving at a set of suitable speeds per horse power to be known as standards for both constant and adjustable speed motors after properly considering the items as set forth in the outline.

#### SHAFTS, FRAME AND DRIVE

Obviously there should be little difficulty in arriving at a proper shaft diameter and key for a given horse power and speed motor. The length of shaft might offer some difficulty, but a compromise length could probably be agreed upon. Special shaft extensions and double shaft extensions, whether for hand wheel or power transmission should be considered.

A uniformity of dimension under the heading "frame" is obviously impossible, but much can be done to reduce the large variety of dimensions to perhaps two or three sets of dimensions per frame, instead of the dozen dimensions now existing. There is, of course, no reason why there should not be a uniformity in the size of the holes drilled in the motor feet per frame.

It is not only important but absolutely necessary to consider seriously the items under the head "drive" in order to arrive at some basis upon which properly to determine the best speeds, shaft dimensions, etc., to standardize.

Here we should consider such subjects as diameter of motor versus length, minimum speed versus size and cost, maximum variation for adjustable speed motor and its relationship to minimum speed, cost and size of motor.

#### GENERAL CONSIDERATIONS

Uniformity of making motor terminals, wiring diagrams, protecting live parts, etc., are of advantage to all concerned.

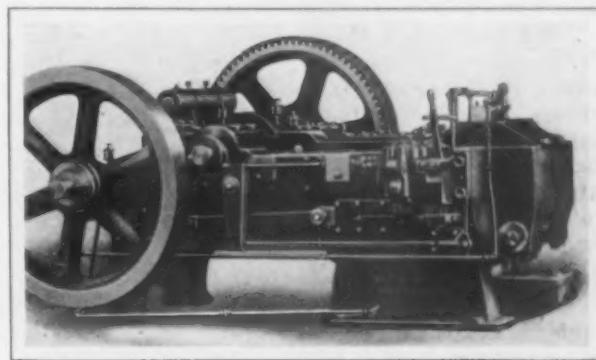
The machine user will derive considerable advantage from the standardization of motor speeds and dimensions, as well as the machine manufacturer, and in order to have something tangible to start with I will tabulate the dimensions under discussion for the various motor manufacturers, and prepare a table of speeds and gears in order to have

something definite to discuss with your Standardizing Committee and others interested.

The importance of the motor-driven machine tool with relation to production has become such that the method of applying the motor to the tool in my opinion warrants far more attention than has been given to it in the past by some of the tool manufacturers, and I trust that before another year elapses that the motor manufacturer and the machine manufacturer will each have a better understanding of the difficulties of the other, and that much will have been accomplished toward the establishing of suitable standards.

#### An Automatic Cold Process Nut Machine

The Waterbury Farrel Foundry & Machine Company, Waterbury, Conn., has brought out an automatic cold pressed nut machine. It possesses sufficient capacity for making  $\frac{5}{8}$ -in. square or hexagon nut blanks from bar stock, and as the blanks leave



An Automatic Machine for Making  $\frac{5}{8}$ -In. Hexagon or Square Nut Blanks from Bar Stock by the Cold Process

the machine they are completely finished with a pierced hole, chamfered and resheared ready for the threading operation which is performed in other machines. One bar of stock follows immediately after another in the operation of these machines, and in this way the machine is not stopped between the bars and no short scrap ends result. The straightening rolls have a quick adjustment for opening and closing, which is relied upon to facilitate the starting of the stock between them and into the ratchet-driven feed rolls.

The only precaution that is necessary in starting the stock is that the end of the bar should be substantially square before it enters the machine. In this way the possibility of the punches breaking is avoided. After the end of the stock is passed between the open straightening rolls and gripped by the feed rolls, the former are brought together by a lever. Where the bars of stock are straight, the straightening rolls are not put into use, but are left open. While the different operations are taking place the tools are flooded with a lubricant. This is pumped from a tank, which, together with the pump, is furnished with the machine. The lubricant is forced through valves and piping, and is caught in a receptacle as it flows from the tools and is carried back to the tank.

In making square nuts there is a small quantity of scrap produced, which consists of the piercings and trimmings from the reshearing operation, while in making the hexagon nuts, in addition to the piercings and trimmings, there is a certain amount of stock which is taken from the sides of the bars. All of this is automatically separated from the nut blanks and falls into a sheet iron pan furnished with the machine.

# Recent Advances in Expense Distribution

## Difficulties of a Sliding Scale of Charges —When Unearned Burden Should Be Carried into Cost of Factory Product

BY STERLING H. BUNNELL

The development and defense of theories of the origin and disposition of non-productive expense or "burden" have filled a large share of space in technical publications of the last 20 years. In the early nineties, there was no known method of distributing factory expense except as a percentage to labor or material or both. The discrepancies between the market prices of different products and the costs computed by this system began to attract attention; and immediately it became evident that the percentage system had no logical basis. Thereupon, accountants, managers and owners engaged in the search for a correct theory of expense distribution.

The first attempts were made in the direction of finding new methods of distributing expense, which should eliminate the errors due to the percentage system. A raise of hourly pay was no reason for a corresponding increase in the burden charge on the man's work; hence a uniform hour-rate of burden charge was devised and advocated. But as larger and more costly machinery was produced and put into shops, the flat hour-rate became increasingly inadequate to cover the cost of operating large machines, without overcharging for the running cost of small equipment. As soon as this point was observed, it became apparent that the correct way of distributing burden depends upon the source of the burden.

### THE METHOD OF FACTORY UNITS

A comprehensive analysis of burden from source to disposal was set forth by A. Hamilton Church, in his series of articles appearing in the technical press in 1901 and following years. The method followed was to suppose the factory to be divided into units, each consisting of one machine or a group of identical machines. Each unit thus became a "little shop," to be treated separately from all other units in developing its appropriate rate of burden. The general expense account of the factory was then analyzed into separate accounts covering items due to land, buildings, power, stores and transport, organization and supervision. Each of these is susceptible of division on some simple basis between the "little shops" or productive units. Thus, land rental can be reduced to a floor space charge and apportioned to each unit, according to the space it occupies; power-plant expense can be apportioned according to the average horsepower hours required by each unit, and so with other expense items. There are, however, the items like organization and supervision, which it does not seem obviously logical to distribute on a basis of floor space, power or value of equipment. These items were grouped into a lump sum and the total then distributed as a percentage of the burden charges apportioned to the productive units. That is, if rental, cost of power, and other items apportioned to unit No. 1 amount to \$50 per month, and organization, supervision and the other general charges amount to 20 per cent. of the total of rental, cost of power, etc., the rate for unit No. 1 becomes \$50 plus a supplement of 20 per cent. or \$10, making a total of \$60 to be charged as burden to the cost of the work done in the month by this productive unit.

Although it has not been explained why in a rational system of expense distribution part of the expense should be dumped over the rest on a percentage basis, this practice is in part correct. The incidence of the land rental on the floor space, and of the power plant expense on the machines, in proportion to the amount of power used by each, is clear enough. The incidence of much of the expense of supervision will be seen on consideration to be on the general burden, since the work of supervision is directed principally toward the control of the items which go to make up burden, such as building and equipment upkeep, and power plant operation. Part, at least, of the amount forming the "supplement" is therefore fairly distributable to the units in proportion to the total cost of maintenance of each—that is, added as a percentage to the burden charge. But the rest of the items of the "supplement," having no apparent incidence upon either tools or burden charge, can only as a make-shift be included in the supplementary percentage.

Having thus apportioned the total expense burden among the separate units of the factory equipment, the next step is to distribute the month's quota among the separate jobs of work done by the unit. No one has yet suggested any method of distribution other than a uniform hourly rate, to be used as a charge for the working time of the productive unit. The time element is uniform only for such items as rent, interest and depreciation; and these do not generally form the larger part of the burden. Unquestionably, work done by heavy cuts at the cost of the maximum power of a machine, with corresponding maximum wear and tear, tool upkeep and use of supplies, should carry a larger burden rate than lighter work done on the same machine.

### UNIFORM HOURLY RATE NOT ACCURATE

The inaccuracy of a uniform hourly rate for distributing the true monthly burden charge of the productive unit is continually evident in shop practice. Foremen will often allow large, powerful machines to stand idle, while smaller machines carrying lower burden rates are crowded with work of sizes up to their capacity limit. A 48-in. boring mill will usually do a 36-in. piece of work much faster than a 37-in. mill, and require little more power and tool upkeep. But the practice of averaging the power and upkeep cost and combining it with the uniform interest, depreciation and building charge may give rise to a burden rate large enough to overbalance the saving in direct labor cost, and so conceal the real economy of using the larger machine. A truly accurate method would provide for a sliding scale of burden charges, according to the size of the work. Allowance would then be made for reduction in expense on small work, or increased expense on work up to maximum capacity, and for extra supervision on difficult work; and for other refinements. With such a system, the burden rate for a 36-in. piece of work on a 48-in. machine would be little more than for the same work on a 36-in. machine, and the real economy of using the heavy machine would not be obscured in the cost

record. The complications involved in applying such a system of burden-rates may be too great to permit of its use.

The running time to be used in calculating the uniform hourly rate is open to argument. Machines cannot generally be run continuously during every working hour. If the full shop working time is used as the divisor of the monthly burden, the resulting hourly rate will cause a deficit in the distributed-burden account, since some working hours will unavoidably be lost. Mr. Church directed that this deficit be distributed through a supplementary burden-rate, either as a percentage added to every burden-rate, or as an extra hour-rate uniform for all production units. Though this method gets rid of the deficit, it is impossible to defend a system of considering last month's losses as an item of next month's costs. Further, since loss by idle time of one machine is thus covered by increasing the burden-rates of the others, the loss by keeping a big machine tool for occasional jobs only is effectively concealed. A shop now contracting outside for an occasional large fly-wheel or pulley, might figure an attractive saving by putting in a costly 16-ft. boring and turning mill for such jobs, under a system by which the loss of this machine through idleness is to be added as a supplementary rate to the burden charge of other tools. Unless the new machine can carry its whole burden on its short working time by means of a correspondingly high rate, and still show a profit on the jobs to be done, its purchase is not justified.

#### THE PARTIAL IDLENESS OF MACHINE SHOP TOOLS

The only possible supposition on which full shop running time, with no reduction for inevitable partial idleness, can be taken as the burden-earning period of the productive unit, is that the units operate in large groups, like textile mill equipment, rather than as independent tools, as in a machine shop. The distribution problem really occurs only under the latter conditions. It is nearly impossible to balance shop equipment so that there shall be normally work enough for every machine all the time. Every superintendent can run over his list of tools and state that one runs all the time, another two-thirds, another almost always, and so on. These are the actual conditions under which shop equipment must be operated, and there is no advantage apparent in dodging the issue that any tool which cannot in its actual working time earn the charges on its floor space, first cost and operating expense ought to be removed.

Results which represent these facts with reasonable accuracy are obtained by taking the expected average number of working hours of each productive unit as the divisor of its monthly burden total. If the resulting hourly rate is excessive, the necessity of finding more work for the unit, so as to increase its working time, is evident. An exception may be made, however, in the case of special machines required for peculiar operations on the factory product, and capable of turning out all the work required in part of the working time of the factory. If there is no way of obtaining outside work for these machines, it is fair to carry their burden deficit as a charge against the equipment generally. The gradual growth of the business will increase the required running time of these machines and accordingly decrease the general supplementary burden, instead of apparently decreasing the cost of work on these machines.

#### BURDEN DISTRIBUTION ACCOUNT

The accounting method of handling the burden distribution system is through an account entitled

Burden Distribution. To this is charged monthly the total of the items making up the factory expense or "burden" and a monthly proportion of annual interest and depreciation, and to it is credited the total of the cost-sheet charges for burden. There will always be a difference between the two sides of the distribution account, due in part to variations in the expenditures, but principally to variations in the hours run by each productive unit. Whether the difference is a debit or a credit decides whether the burden is under or over distributed. The differences are sometimes carried forward from month to month and may thus equalize each other and show in the end a trifling discrepancy between expense outlay and distribution charge. Some men prefer to write off each monthly difference by charging it into the next month's burden and altering the established burden rates accordingly. If the "supplementary rate" is used, the difference of the previous month is worked into that. In such cases the aim is evidently to get rid of any undistributed burden by charging it somehow into the cost of work.

These differences between expense and burden charges have, however, important significance according to the cause from which they arise. If the balance between the two sides of the distribution account shows under-distribution, and is due to short running time of productive units, caused by conditions arising within the shop itself, the deficiency is a shop expense, and is properly carried into the general burden, or distributed in the supplementary rate. Such conditions may be, for instance, an accumulation of work for one class of tools and deficiency in work suited to others, or bad planning or supervision, allowing tools to lose time between jobs. On the other hand, deficiency in distributed burden due to idle equipment from lack of orders, strikes, or outside disturbances, cannot be considered an item in factory cost, but is clearly a business loss, like a bad debt or any other contingent expense of conducting business. Business losses should not be charged into factory cost, and burden "unearned" from such causes should therefore be carried into the profit and loss account and not added to the cost of factory product.

#### "UNEARNED BURDEN" AND MANUFACTURING COST

The conception of unearned burden and its meaning was brought out in a paper by Clinton H. Scovell, presented at the October, 1913, meeting of the National Machine Tool Builders' Association. A sharp criticism of this paper appeared editorially in the American Machinist in one of the issues of November, 1913. It was stated as an axiom in that editorial that "expense must be extinguished as soon as possible," therefore unearned burden should be promptly dumped over the general product by an increase in the rates. This view of the matter does not seem justified. In general, debts should be paid, losses should be made up, and expenses covered as soon as conditions permit; but not by manipulation of accounts. Good accounting practice puts factory expense into factory cost, and general expense into general cost. Before distributing unearned burden into manufacturing cost, it should be looked over carefully to see whether it belongs there. If loss in burden earnings, due to lack of work, is concealed by charging it off through increased burden rates, the owner will be unable to understand why his factory returns cost higher than the prices other factories ask for the same products.

The general confusion with regard to the principles underlying the incidence of factory burden

are well illustrated by a further quotation from the same editorial article. "Machine shop expense," it says, "must be apportioned according to some law of averages. If an expense comes from an unavoidable cause, as the idleness of a part of a group of producing machines due to a slackness of orders, it is a part of a shop expense and must be borne by the product. On the other hand, if a loss is from an avoidable cause, it may be justifiably considered as an unearned burden."

It must be clear upon the slightest consideration, that it is the cause itself, and not its avoidability, which should govern the treatment of a burden deficit—or for that matter, of a burden surplus, which may equally well occur. Slackness of orders is truly unavoidable from the point of view within the factory, being a condition arising outside of the manufacturing department. Therefore, loss from this cause cannot possibly be considered an item of manufacturing expense. The amount of this loss appearing as "unearned burden" should be put as a separate percentage item into the gross cost of product, leaving the manufacturing cost unchanged by such a variation in trade, not factory, conditions. On the other hand, lost production through bad shop routine, such as failure to move work in progress in advance of workmen's needs, is an avoidable cause of a deficit in distributed burden; yet it is undeniably an item of the existing manufacturing cost, and should be distributed promptly by increasing the burden rate. Better management will overcome the defective routine and will show very properly in burden reduction.

#### BURDENING BY A SLIDING SCALE

The progress of accounting science will undoubtedly evolve for general use, a comparatively simple method of distributing burden, through a sliding scale of rates based on the size and character of work as affecting cutting-tool up-keep expense, power and supplies cost, and degree of watchful supervision required. The scale rates will include an item for interest and depreciation, which usually varies less as between machines of different sizes which may be used interchangeably on work within their common limits, than does the cost of cutting tools and power. The rates will be based on the average running time of the works, less a percentage for probable unavoidable idle time; as for instance, a net actual working time of 150 hours per month out of a possible 175. The cost of work on a proposed new machine to be installed for doing "at home" work which might be done outside by contract, will be considered in connection with the unearned burden due to the probable idle hours of the new machine, and the advantages to the factory of doing the work "at home," as compared with the cost of those advantages in unearned burden. Under such a system, there would be no disturbing incentive for the foreman to use small machines while larger and more efficient ones are available, in order to keep down the cost-sheet charges for burden. Deficits in the distribution account would then always mean unearned burden, which would be an affair for the sales and administrative departments, recording the fact of a deficiency in manufacturing orders.

The exports of Caucasian manganese ore through the ports of Batoum and Poti amounted to 1,059,810 tons in 1913, an increase of 160,885 tons over 1912. Germany took 38 per cent. of this, and Great Britain and Belgium were next in order. South Russian works are gradually neglecting the Caucasian ore in favor of that from the Nicopol district, having used only 9940 tons last year, as compared with 16,870 in 1912.

#### A New Alternating-Current Tachometer

For use in mills, power plants or shops, where the operating conditions are somewhat severe, the Bristol Company, Waterbury, Conn., has brought out a new electric tachometer of the alternating-current type. Although the device is an electric tachometer, it is emphasized that no sliding contacts or brushes are used in it and delicate millivoltmeter movements are not required. The im-



A Recording and Indicating Tachometer Having an Induction Magneto and Designed for Use Where the Operating Conditions Are Somewhat Severe

portant features of the tachometer are the use of an induction magneto and a special voltmeter movement.

In the accompanying engraving a combination indicating and recording unit is illustrated. This arrangement gives an indicating instrument for the operator and a recording instrument for furnishing a permanent record in the office of the superintendent or foreman. It is pointed out that either instrument can be located at almost any desired point, as long leads can be supplied, and it is also possible to connect more than two instruments, if this should be required. The tachometer can be furnished in either recording or indicating types only. The magneto is of the induction type without any sliding contacts or brushes and the indicating and recording instruments are voltmeters.

The indicating instruments have a standard type of pivot jewel bearing voltmeter movement, while the recording instrument is equipped with one of the builder's improved voltmeter movements. It is pointed out that the design of the movement is such that there is plenty of power available for actuating the recording arm, even though the recording pen is in continuous contact with the surface of the chart. Frictionless knife edge bearings are used to support the movement, which has a new patented supporting device for the moving elements that is designed to eliminate the temperature error. Three different sizes of recording instrument are made for use in connection with charts of 6, 8 and 12 in. in diameter.

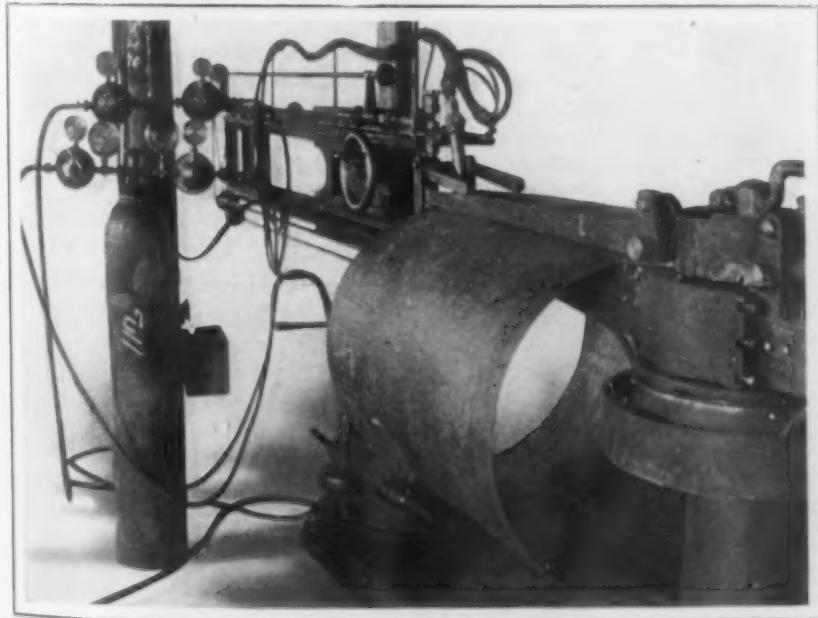
A windmill, with steel sails 50 ft. in diameter, mounted on a steel tower, has begun work in Holland in drainage service. It has a capacity of 40,000,000 to 43,750,000 gal. per hour, and is said to be the largest in the world. Steel windmills are displacing gasoline motors, which in turn displaced the wooden mills in that country.

## WELDING OF STEEL BARRELS

## A Machine for the Closing of the Longitudinal Seam by the Autogenous Process

The Davis-Bournonville Company, Jersey City, N. J., has produced a machine for closing the longitudinal joints in a steel barrel by the oxy-acetylene process. The barrel bodies to be welded consist of plates of steel about 3/32 in. thick, bent to form cylindrical shells. The joint is formed by bringing the edges together without lap, and as no welding rod is employed an excess of metal is provided in the immediate region of the joints by upsetting.

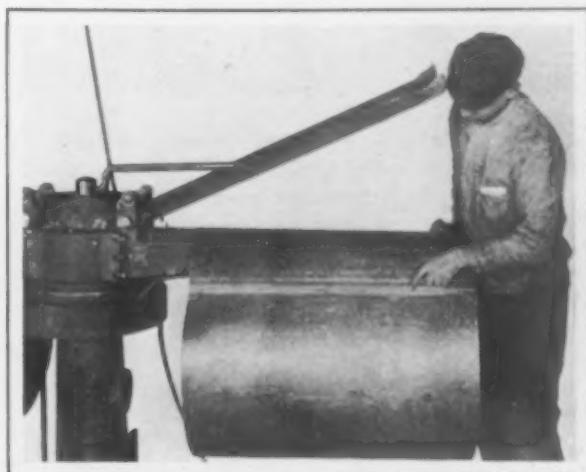
The machine consists of a base, to which two cylindrical pillars are fastened to support the moving parts employed for driving the torches over the work. A heavy bracket or holding device is mounted on the pair of pillars so as to encircle each of them, and at the same time is capable of movement in the vertical plane. The movement of this bracket is accomplished by a rack in the pillar and a pinion which is mounted in a shaft that is journaled in lugs forming a part of the bracket. The arms upon which the torch travels are fastened to the bracket. There are two torches used which make acute angles with the unwelded portions of the joint. Both of these may be used simultaneously, a preferred arrangement being to have the lower torch operate at a point slightly in advance of that at which the upper torch is working. In this way, one torch works on a joint from above and the other from below, the effect of this arrangement being that the lower torch will perform a large portion of the heating necessary. Thus a torch of small power may be employed above. By means of a number of special devices, which are detachably mounted on the arms, the torches can be varied both as to position and inclination. These torches are driven by power, the rate of operation being in proportion to the character of material being used.



View of the Barrel Welding Machine Showing the Barrel Body Locked in Position Ready for the Welding to Begin

The edges of the barrel are placed in the proper position and are locked there by clamping arms. The arm upon which the barrel body rests is then swung around under the torches and the welding operation proceeds. While this barrel is being

welded another is being placed in position on the opposite end of the machine. As soon as the first barrel is completed it is swung back to the first



The Outer End of the Machine Where the Work Is Put on and Taken Off

position, where it is taken off and another sheet of steel substituted while the one at the opposite end is being welded.

## Proposed National Bureau of Employment

WASHINGTON, D. C., May 6, 1914.—Representative Murdock, of Kansas, the Progressive leader of the House, has introduced a bill drawn by the United States Commission on Industrial Relations to carry out the project for the establishment in the Department of Labor of a bureau to be known as the Bureau of Employment, referred to in last week's issue of *The Iron Age*. The purpose of the bureau is to lessen the amount of unemployment by studying the causes and extent thereof, by regulating the interstate employment business of private employment agencies and by bringing together workmen of all kinds seeking employment and employers seeking workmen.

The feature of this bill of chief interest to manufacturers and other employers is found in section 5, which gives the proposed bureau jurisdiction over all existing employment agencies which do an interstate business. This jurisdiction would include all private agencies, even those maintained by manufacturers for their own business, provided workmen engaged thereby are sent from one State to another or induced to cross a State line to secure employment, or to reach a plant in which they are to be employed. All such private agencies are required to pay licenses and are subjected to rigid inspection and supervision.

The bill, while it is said to be tentative in form, has been drafted with considerable care and an early report upon it is already being urged on the Committee on Labor, to which it has been referred. Persons desiring to suggest amendments will do well to forward them in

duplicate to the United States Commission on Industrial Relations and to Representative D. J. Lewis, chairman of the House Committee on Labor. Hearings just begun in leading cities will also afford an opportunity of making suggestions.

W. L. C.

# Largest Coal Handling Plant in the World

## New Type of Equipment Erected at Norfolk, Va.—Inclined Tracks Replaced by Powerful Elevators Hoisting 115-ton Cars

A new coal handling plant recently built for the Norfolk & Western Railway at Lamberts Point, Norfolk, Va., is of interest because of its size, probably the largest coal handling plant in the world, and because of a radical departure from usual design of coal handling plants, making it the first one of its type. In other coal handling plants of this general type now in operation along the seaboard loaded cars are either hauled up the steep incline from the track elevation to the top of the pier by electric "mules" or shoved up long inclines by locomotives. In this plant the inclined track has been eliminated and in its place are powerful electrically operated elevators for lifting loaded transfer cars to the top of the pier. Advantages claimed for this type of plant are that it is more economical, less power being required for raising the cars with the elevators than with the incline haulage system, and that considerable valuable dock space is saved. The plant has a theoretical coal handling capacity close to 30,000,000 tons a year, and it is expected that it will actually handle 15,000,000 tons or over.

The plant consists of two car dumpers, 12 electrically driven 115-ton transfer cars, two transfer car elevators, and a double steel pier extending out into the water, 1200 ft. from the bulkhead at the water's edge, the pier being 90 ft. in height above mean tide. The pier is provided on each side with 32 pockets, each having a capacity of 120 tons. It is said to be longer and higher and to have more pockets than any coal handling pier previously built. The dock is of sufficient length for loading of four boats at a time, two on each side.

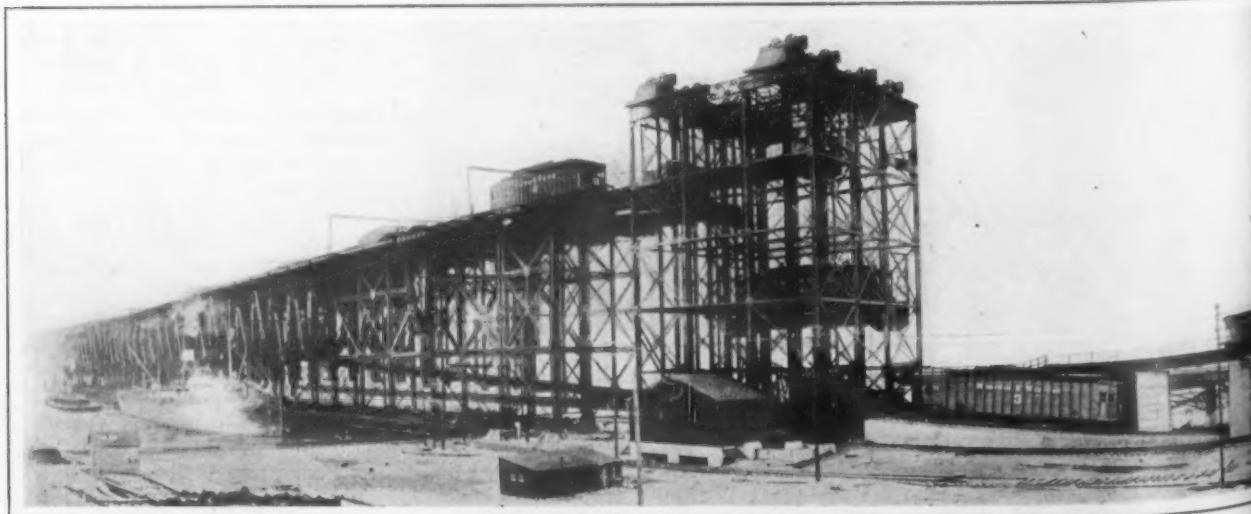
The plant is designed for handling coal from cars with capacities ranging from 30 tons up to the new Norfolk & Western 12-wheel, 90-ton cars that were built for hauling coal from the West Virginia fields to this terminal. These 90-ton cars are the first coal cars built in the United States exceeding 70 tons in capacity. The cars weigh about 60,000 lb. each. A simple but effective track system with spring switches has been provided so that transfer cars make a circuit through the plant and return

to their starting point, and spring switches are provided for the convenient handling of the standard railroad cars.

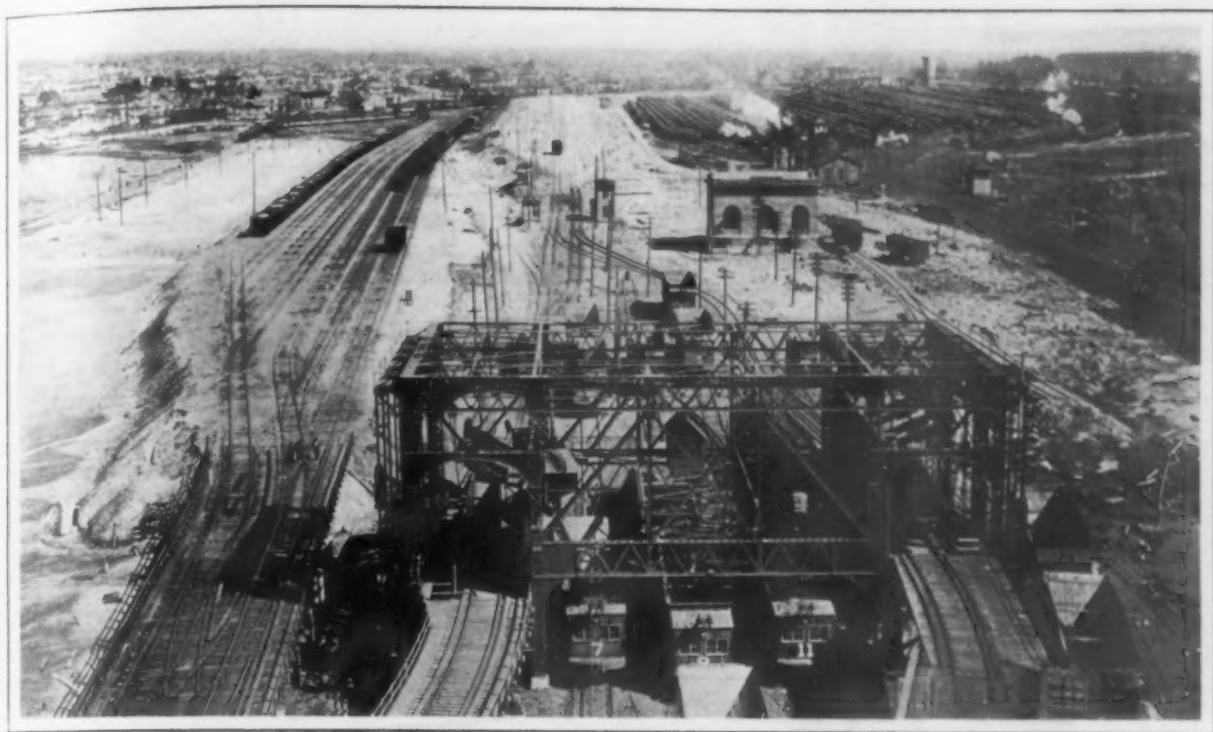
In the general view of the entire plant, the pier and elevators are at the left, the car dumpers near the center, and the power substation to the right. Loaded cars are placed in a large storage yard in the background to the right, the bird's-eye view, which shows one side of the car dumpers in the foreground, having been taken from the top of the pier. The storage yard is located on a grade, so that the cars will run by gravity from the yard to the approaches to the dumpers. On their way down they pass over two E. & T. Fairbanks & Co.'s 200-ton scales, equipped with Streeter-Amet automatic recorders, on which they are weighed. Before reaching the scales on their way to the approach tracks near the dumpers the cars are cut apart, and on reaching the approach tracks they are hauled up the incline to the dumpers by electric "mules," there being a separate mule for each dumper. The dumpers discharge the cars into the special bin-filling transfer cars. The railroad cars are then run from the dumpers down a gravity track to a spring switch, and then again down by gravity to the empty car storage yard to the left.

The car dumpers are of unique construction in that the two dumpers are built in one frame, facing each other. Otherwise their construction features are standard. They are built for handling cars up to 100-ton capacity, or a total weight of car and contents amounting to 275,000 lb., and will handle cars up to 53 ft. long. The present 90-ton cars are 48 ft. long. As each dumper can handle 30 of the largest cars per hour the capacity of the dumping equipment is one car per minute, and the remainder of the plant is designed for handling with the same rapidity that can be maintained with the dumpers. One dumper has dumped 36 cars an hour, and the two combined have dumped 66 cars in 1 hr. A view of the dumpers in the act of dumping is taken from the pier side of the dumpers.

The transfer cars are the largest coal cars ever built, being of 115 gross tons capacity, so that each



General View of the New Norfolk & Western Coal Handling Plant at Norfolk, Va., Showing the Coal Pier and Transfer Car Elevators



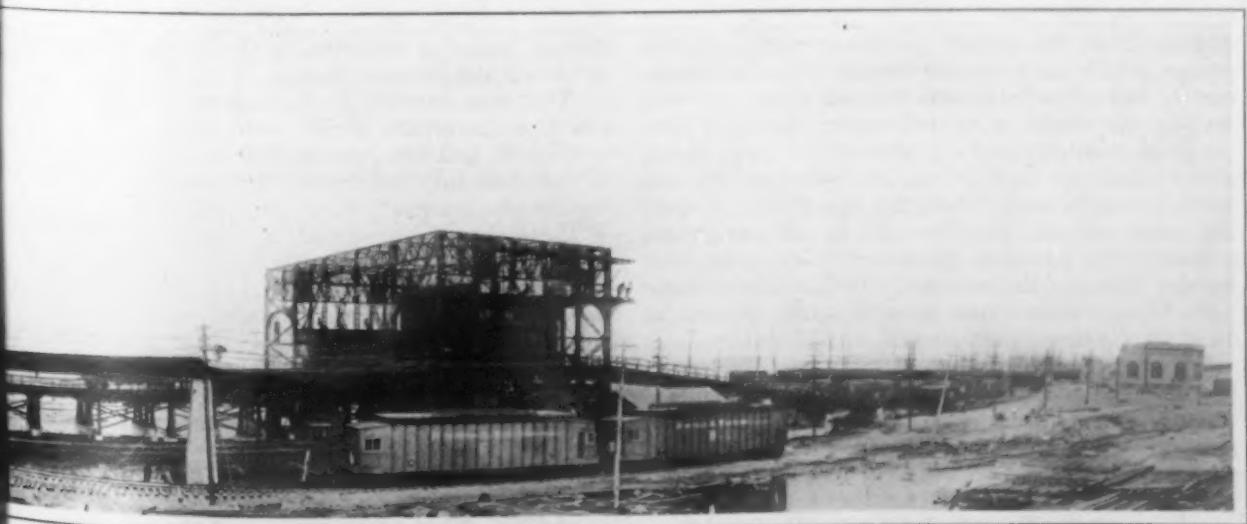
Bird's-eye View of the Car Storage Yards with the Dumper in the Foreground

transfer car holds the contents of two 57½-ton coal cars, the railroad having a large number of cars of that capacity. These transfer cars are mounted on six-wheel trucks, the wheels of each truck being connected with locomotive type connecting rods, the purpose of which is to get tractive effect and to help in controlling the cars when they come down the steep grade from the top of the pier. The cars are provided with dynamic braking control, the motor being used as a generator to give resistance to rotation and thus serving as a brake without mechanical appliances. This application of dynamic braking to cars is new and makes the work of the motorman simple and safe. The cars are equipped with electric lights, standard air equipment for sanders, airbrakes, air-operated signals and standard couplers. The airbrakes, however, are used only for emergencies and the spotting of the cars. The cars are 63½ ft. long, 15 ft. high and 12 ft. wide overall, and are built of steel throughout. There is an inclosed operators' cab at each end. Each car weighs 120,000 lb. empty.

After receiving their loads the transfer cars

run under their own power across the yard level to the elevators located near the water's edge, which hoist them approximately 75 ft. to a level with the pier, and the tracks of the elevators automatically align themselves both vertically and horizontally with the tracks on the pier. Leaving the elevators the cars run out on the pier under their own power and the loads are dumped into the pockets. The cars are of the drop-bottom, self-cleaning type, with air control for dumping, and the load is discharged in from 6 to 7 sec. After the cars are dumped they are run to the outer end of the pier over a spring switch and down a track built in the center of the pier at a grade of 6½ per cent. to the yard level, which they reach near the car dumper site after traveling about 2000 ft. From here they run through the dumper on the center track, shown in the illustration of the dumpers, and through a spring switch, and back in front of the dumpers, where they are again ready for their loads after traveling over a continuous loop.

The elevators are counterbalanced so that the load going up gives the same load on the motors as



Is Loaded, at the Left; the Car Dumper with Two Transfer Cars in the Foreground and the Power House at the Extreme Right

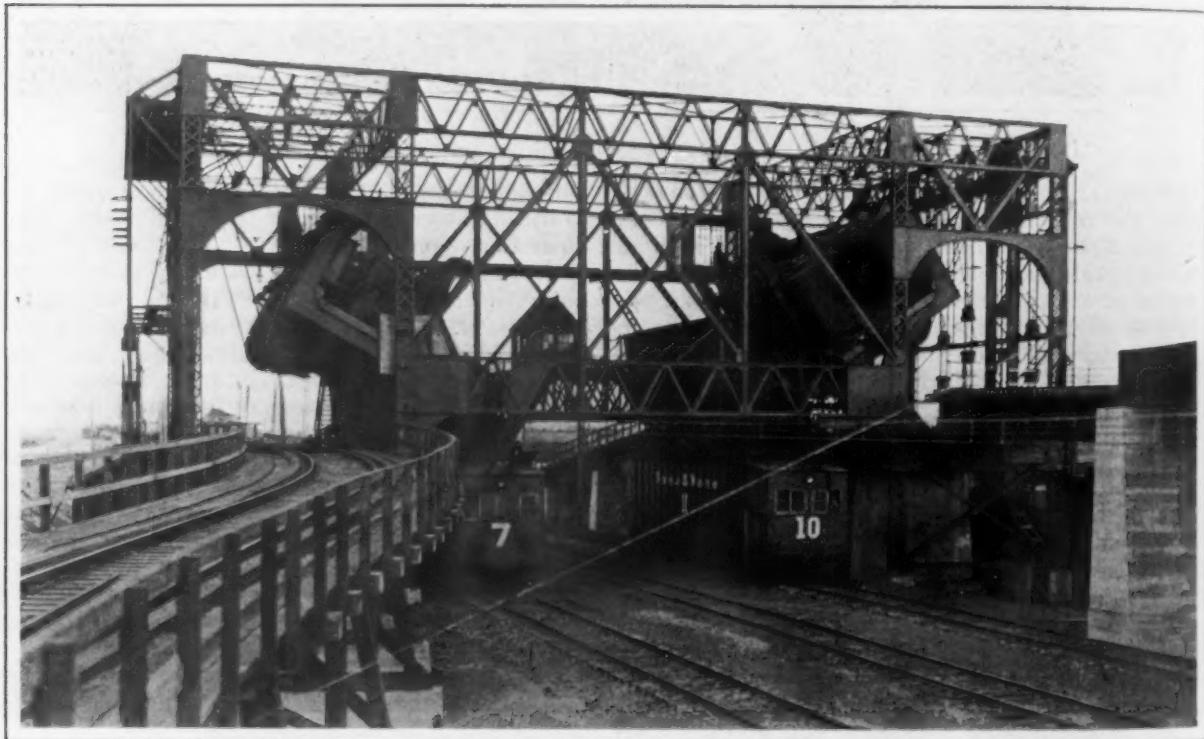
the empty cradles going down, thus reducing the power consumption and making the control easier. The counterweights are heavy blocks of cast iron, traveling in guides very similar to those seen in office building elevators. The elevators are designed to handle loads of 375,000 lb., being probably the largest elevators in existence.

The 1200-ft. steel framework pier is supported on foundations composed of concrete cylinders 20 ft. in diameter, spaced 30 ft. between centers. These cylinders are built up from below the bed of the bay through 35 ft. of water. The 32 120-ton fixed coal pockets on each side of the pier are spaced 30 ft. between centers. They are conical in shape and because of having no sharp corners clean themselves rapidly. Coal is discharged from the bottom of the pockets into a vertical tube, from the outer side of which extends a movable chute, this side of the chute being inclosed by a curtain that moves with it. The chutes are counterweighted and are made adjustable to meet changing conditions due to different sizes of boats and the

## Properties of High Speed Steels

A paper of considerable metallurgical importance was read before a general meeting of the Institution of Mechanical Engineers, London, England, March 20, entitled, "The Chemical and Mechanical Relation of Iron, Tungsten and Carbon and Iron, Nickel and Carbon." It was contributed by Professors J. O. Arnold and A. A. Read. The paper, in its details and length, is highly technical. The following extracts from comments in the Engineer, London, give the essential points:

The authors prepared a range of steels, all of practically the same composition except as regarded the tungsten content, which ranged from 2.38 to 26.29 per cent. Bars of these steels were thoroughly annealed, and by an electrolytic method the carbides which they contained were isolated. On analysis these carbides were found to contain carbon, iron and tungsten, and it was noted that, as the tungsten in the original steels increased, the carbon in the carbides obtained decreased, the iron



View from the Pier Side of the Dumpers in the Act of Dumping Two Cars Simultaneously

changes in the tide. Coal is discharged through a gate from the bottom of the pockets into the chutes, which are arranged for the minimum breakage by fall. The hand-operated machinery for controlling the chutes is located on the top of the pier.

Each transfer car is driven by two 60-hp. motors, one on each truck, each dumper by two 250-hp. motors, each "mule" by two 250-hp. motors, and each elevator has two 450-hp. Westinghouse motors. The power is furnished to the substation by the Virginia Railway & Power Company, being transformed there from an alternating current at 11,000 volts to a direct current at 500 volts.

The structural steel coal pier was erected by the Virginia Bridge & Iron Company, Roanoke, Va. The car dumpers, cars and elevators were designed and built by the Wellman-Seaver-Morgan Company, Cleveland, Ohio. The construction of this great pier was handled directly by the engineering department of the Norfolk & Western Railway Company.

in the carbides at first decreased and then increased, and the tungsten in the carbides at first increased and then decreased.

That iron carbide,  $Fe_3C$ , tungsten carbide,  $WC$ , and iron tungstide,  $Fe_2W$ , were definite chemical compounds had been established by other workers, so that the duty before the experimenters was to explain the composition of their carbides in terms of these three compounds. It was found possible to do so with great consistency. From the steel having the lowest percentage of tungsten a carbide was obtained consisting of a mixture of iron carbide and tungsten carbide, the former greatly predominating. As the tungsten content of the original steel increased, the iron carbide in the residue became less and less, while the tungsten carbide increased until with about 11½ per cent. tungsten content in the original steel the iron carbide in the residue completely disappeared. Thereafter the residue consisted of tungsten carbide with a continually increasing percentage of iron tungstide.

The percentage,  $11\frac{1}{2}$ , of tungsten at which iron carbide ceases to exist corresponds to the lower limit of tungsten in modern high-speed steels. The iron tungstide which forms above this limit is as hard as felspar, being 6 on Moh's mineral scale. It can only be drilled with difficulty by a special drill which can easily drill the hardest chilled white iron. To its presence and to the suppression of iron carbide by the addition of tungsten to the original steel, the peculiar properties of modern high-speed steels of the tungsten class seem therefore to be due.

In the nickel portion of their research, Professors Arnold and Read prepared a variety of steel alloys approximating, as closely as possible, one another in composition except as regarded the nickel content, which ranged from 0.60 to about 30 per cent. The carbides present in these steels were again isolated electrolytically and analyzed. It was found that in those steels containing up to about 8 per cent. of nickel the carbide present was almost entirely the carbide of iron,  $Fe_3C$ , the quantity of nickel carbide,  $Ni_3C$ , being almost negligible.

The next steel on the list was one containing about 13 per cent. nickel. It was an extremely hard metal and defied both hack saw and turning tool. The alloys immediately preceding it had quite ordinary mechanical properties, having yield points of about 30 tons, ultimate strengths of about 40 tons, and elongations of about 30 per cent. in 2 in. This 13 per cent. nickel steel was, however, quite extraordinary. Its yield point was about 60 tons, its ultimate strength from 80 to 90 tons, and its elongation in 2 in. about 12 per cent. A round bar of it  $\frac{5}{8}$  in. in diameter could be bent through 167 deg. before it broke. After farther research the investigators came to the conclusion that the material they were dealing with was a definite chemical compound, nickelide of iron, having the formula  $Fe_3Ni$ , and that this substance "was perhaps the most remarkable known to ferrous metallurgy." When the nickel percentage in the original steel was increased above 13 per cent. the mechanical properties of the alloy rapidly fell back to their former quite ordinary values, and on analysis of the carbides present in them it was found that iron and nickel carbides were both in existence, and that the latter was in predominance.

#### Accidents as Related to the Time of the Week

The question of the influence of the day of the week on the numbers of accidents was touched on recently in an address by Dr. Harold H. Baker, medical superintendent of the Bausch & Lomb Optical Company, Rochester, N. Y., at a meeting of the Efficiency Society of Rochester. Figures, covering 1300 accidents, showed that Mondays and Saturdays were productive of a much higher percentage of accidents than other days of the week. The daily number of accidents, on an average, were found to be as follows: Monday, 253; Tuesday, 196; Wednesday, 194; Thursday, 197; Friday, 195; Saturday, 265.

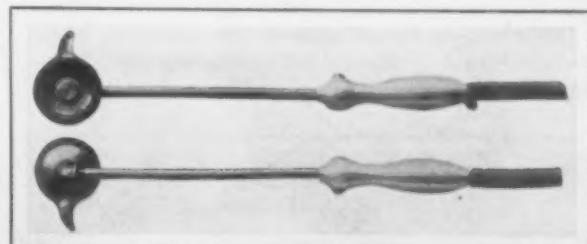
This was explained thus: On Mondays the workmen are not properly keyed up to their tasks; there may have been dissipation over Sunday. In other words, their minds are not alert. On Saturdays the same conditions exist, except that the men are rushing their work, or their minds are on plans for the rest-day.

"Only 15 per cent. of factory workers are physically perfect," said Dr. Baker. The percentage summary of defects was given as follows: Defective eyesight, 15 per cent.; predisposition to tuberculosis, 15 per cent.; rupture, 4 per cent.; heart disease, 4 per cent.; defective hearing, 12 per cent.; defective teeth, 45 per cent.; not fully immune against smallpox, 42 per cent.; operated on for appendicitis, 8 per cent.; defective feet, 6 per cent.; digestive troubles, 8 per cent.

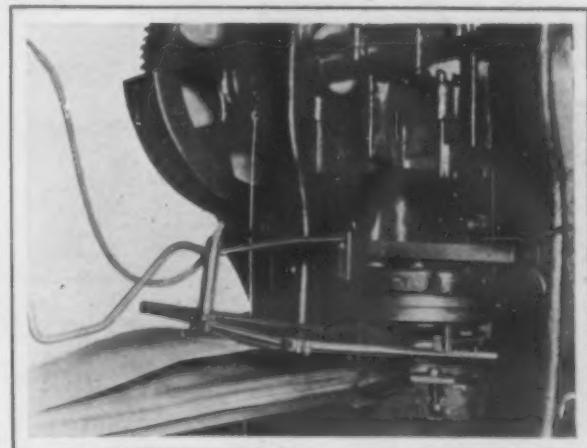
#### Vacuum Lifting Device for Power Presses

In addition to the hand-operated safety suction device, which was illustrated in *The Iron Age*, April 23, 1914, the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., has developed an automatic vacuum lifting device. It is designed to feed metal sheets through a punch press, without any danger to the operator's hands. The general method of operating this class of machinery is to employ two men, a helper at the back of the machine to feed the stock in and an operator at the front to control the movement of the press slide and remove the finished work. With this new device the services of the helper are not required, which is, of course, a saving in the cost of operation.

As will be noted, the device is a very simple affair. It consists of a lifting device or "sucker" about 8 in. in diameter, which is connected to a



A Recently Developed Vacuum Lifting Device for Feeding Metal Sheets into Punch Presses Without Jeopardizing the Operator's Hands



The Device Applied to a Press for Automatic Operation

suction line by a rubber hose. It can also travel freely on an irregularly shaped rod, the amount of motion being controlled by the press operator, through two guide arms or handles, which are located inside of the press housings, one on either side of the punch and die. In operation the pile of metal sheets is placed at the rear of the press preparatory to being punched the same as in an ordinary press. The operator at the front of the press pushes the guide arms through the press toward the pile, and the irregularly shaped rod allows the "sucker" to drop down until it rests upon the top sheet of the pile. A lever on one of the guide arms is then pressed, which opens the suction valve and causes the "sucker" to grip the sheet of metal. The operator does not release his hold on the guide arms or the suction lever until the first blank has been punched. In this way it is pointed out that practically all danger of injury to the hands is removed, as in punching the succeeding blanks, there is almost invariably sufficient scrap or margin to enable the operator to pull the sheet forward.

# Modern Practice in Structural Shops

Special Machines Developed to Save Time and Labor—Operations in Multiple—Increased Facilities for Handling Materials

BY C. A. TUPPER

In the average bridge and structural shop there is to the casual observer little evidence of progress from year to year, except as new shops are built. Close examination, however, shows that, compared with only a few seasons ago, there have been marked developments in equipment and methods, as well as in the construction or altered arrangement of buildings, yard structures and runways.

The greatest degree of progress made has unquestionably been in the handling of materials. For a fabricating plant this is the most important detail of the work, so far as economy of operation is concerned. Speed in the use of the various machines or tools does not here, as in a machine shop, play the

the tendency now is to provide smaller, rapid-production machines especially designed for crowding through the light work at maximum speeds, and to restrict the heavy work to a much smaller number of large machines. This development alone, while adding to the number of tools, extending the floor space used and increasing the overhead expense, has enabled so much more work to be put through in a day that the unit cost of production is considerably reduced.

Economy is further promoted by care taken in the design of structural members to assist the work of the shop. For example, regular rivet spacing, even where members are joined, permits multiple



Bridge Shop of the Maryland Steel Company, Sparrows Point, Md., Showing Alliance Cranes in Good Arrangement for Handling Heavy Work

leading part in production. It is the unloading, storing and picking up of material, the getting it to and away from the machines, and the shipping out of the finished material, properly marked for erection and loaded on cars in delivery time, that count for most. The expensive layout which must be maintained for each unit of production demands that every possible minute be saved in tool work. It is a factor which shop managers must watch. That they appreciate the fact is shown by some of the improvements recently brought about in steel fabricating machinery.

One of the most notable changes has been the development of the heavy duty machine for massive work. Many types of floor machines, such as shears, punches, bending rolls, straighteners, spacing tables, saws, etc., have developed much larger capacities and heavier patterns of construction than formerly. This has been accompanied by a growing distinction between heavy and light work. Instead of trying to handle both kinds of work with the same tools

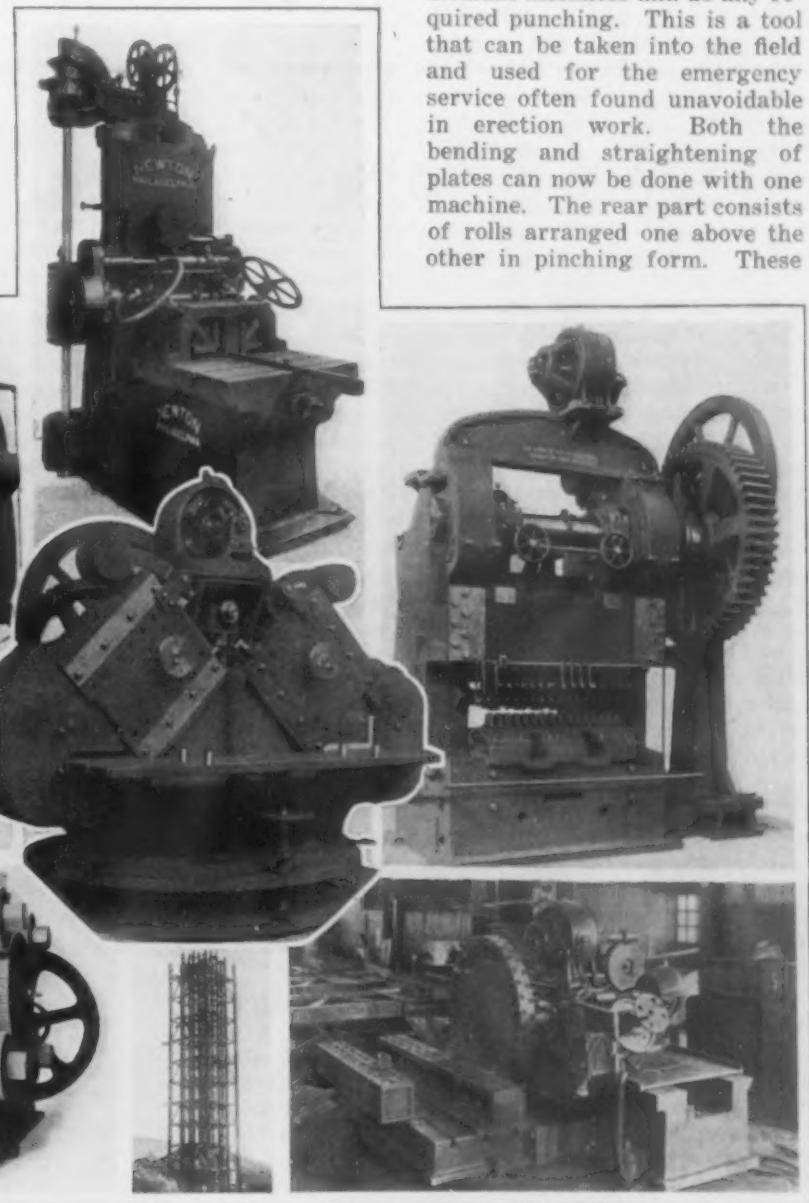
punching. Ample clearances are also being generally allowed for in the design of structural work, as, except in the case of minimum weight sections, exact dimensions are difficult to maintain at the mill, owing to various causes such as the wear on the rolls.

Operations in multiple such as punching, drilling, boring, etc., using any number of heads from say two to eight, with side travel on a common saddle and any necessary vertical adjustment, are an important improvement. Given regular spacing, a large number of pieces can be put through in a day by this method. Even with varying spacing or other irregularity, it takes very little extra time, on account of the ease of adjustment, particularly with templets used in setting. The great bulk of work done on built-up members is, of course, reaming rather than drilling. Any inaccuracy in the matching of punched holes is also best corrected by this means, so-called drifting being now considered very bad practice, except for emergencies.

Then there is the specialization of one type of machine for any one of many operations. The use of planers for a number of purposes has steadily increased, as in truing plate edges or finishing expansion bed plates. An interesting development has been the growth in favor of rotary planing machines. In one shop visited a machine of this type, 48 in. across the cutting face, was being used in planing the ends of 20-ton columns specified for a large public building. Beams laid horizontally, however, do not require such finish, as they are or should be made to frame with ample clearance, especially to column webs.

Milling machines for braces or stiffeners have recently come into vogue, as for web stiffeners which have a close bearing against the flange angles, and they are being extensively utilized for finishing the ends and chamfering the corners of angle braces, instead of holding them against a grinder. One of these tools commonly holds two an-

A handy machine for plant, stockyard or warehouse is a combined sawing and rotary planing machine. For the first named function these are in some places displacing friction saws where the latter leaves a fin that has to be removed. They are also useful as saws, for cutting out trough plates, corrugated plates, checkered plates, washboard sections, crimped angles, etc. The planer face can be used for a great variety of finishing-off work. Another combination machine, which forms a favorable adjunct, especially to small shops or plants doing only a limited amount of structural fabrication, is one which will shear angles, flats and plates of light or medium thickness and do any required punching. This is a tool that can be taken into the field and used for the emergency service often found unavoidable in erection work. Both the bending and straightening of plates can now be done with one machine. The rear part consists of rolls arranged one above the other in pinching form. These



Modern Machines for the Structural Shop: At the top, a Milling Machine Working On Angle Braces; in Center, Heavy Angle Shear; at Upper Left, Heavy Duty Punch; at Upper Right, Multiple Punch for Light, Rapid Production; at Lower Left, Beam Straightener; at Lower Right, Rotary Planer

gles to be operated on simultaneously, or, with the vise removed, it can be arranged to work on the ends of columns or other heavy pieces. A duplex machine of this type, quite large in build was used to finish parts of the Panama locks' gates. With still another design, columns, posts or struts can be milled to accurate bearing at joints, etc. A further innovation is a "chord" boring machine mounted on an elongated base, which enables the longest members to be handled at one setting. This can be arranged with a single head or in multiple, the boring and travel being effected horizontally.

are actuated by the same drive as the bending rolls but can be quickly lowered beneath the plane of the latter, so as not to interfere with their action.

Provision is also made in some shops for single or combination machines to be used in threading and upsetting. It is usually economy to purchase the finished bolts and the like from manufacturers who make a specialty of it; the upsetting work can often be farmed out to advantage. Radial extension drills swung on a long arm from a wall or completely around a column allow holes to be drilled or reamed out at any place within a considerable area, without moving work and often simultaneously with other

operations. The work can of course be brought on trucks under one or more of these drills. In one plant the writer recently saw a long girder being worked on by three of these machines. As all joints, nowadays, are fully spliced, such a tool has particular advantages for quickly putting through a heavy built up member. One of this class was described in *The Iron Age*, February 12, p. 442. Rigs not unlike this can also be utilized for any tool having a vertical cutting feed or even adapted to those with a horizontal motion, as in boring pin holes.

Among heavy machines, one of the most interesting features has been the remarkable development of straighteners. Anything from an I-beam to heavy built-up columns and girders, say to 30 in., can now have the "kinks" taken out of it by a machine, avoiding the costly work of the bending floor. One of the largest machines ever built is illustrated herewith. This was installed by the Bethlehem Steel Company. It takes five motors to operate it, the straightening force being exerted through a 115 hp. motor.

Besides the overhead electric travelling cranes used for at least the main bays of bridge and structural shops, the service offered by jib cranes, wall cranes, column cranes and monorail travellers or telphers, with the hoists auxiliary to them, is receiving increasing recognition. Monorail systems have come prominently to the front within the past two years, and they range from the simple trolley and chain block hoist to apparatus which includes electric drive with an operator's cage and hooks or fingers for picking up and transporting material in piles. This is an idea which was developed in wood saw mill yards. For light monorail systems, where the load is pushed by hand, sectional tracks that can be clamped and bolted in any position have been found an advantage, as this enables the floor layout to be changed at will and still bring the hoist directly over any work for which it is needed. In fixed systems, whether span or single rail, a swiveling extension arm, which enables a hoist to be "nosed around" into any side bay or corner, is a convenient arrangement.

Locomotive cranes are meeting with increasing favor, not only to handle material to and from storage, etc., and for general yard service, but also to do hauling where a locomotive is not available. Magnets, swung from overhead cranes or the booms of locomotive cranes, have proven a decided economy at some plants.

For riveting service the progress made follows the general practice described for boiler, tank and plate shops in *The Iron Age*, December 25, 1913, except that the ordinary requirements of the plant itself are much less, so large a proportion of structural riveting being done in the field where the erection takes place. An interesting feature of present practice is the tendency to use better and better grades of tough alloy steel for the rivet sets. The best tool steel is now considered none too good.

Welding outfits have been proposed for structural shops, but in good practice welding is not allowed. The same equipment, however, is used to some extent for cutting by the oxy-acetylene or oxyhydric process. Re-annealing is more and more done, and in some cases will be insisted upon by the user of the fabricated steel. Before eye-bars, for example, are bored, they must be well annealed and carefully straightened; also accurately centered, so that pins 1/32 in. smaller in diameter can be passed through a row of bars.

There is still much that can be done to improve the general conditions of the industry, and many good features of practice can yet be borrowed from

other plants, as machine or steel-car-building shops. Reinforcing rod and bar work, for one thing, have made many innovations necessary. Steel frames and sashes for the glass-side "shed" construction have called for others. The special equipment required for such purposes was described in *The Iron Age*, December 18, 1913. These will have an influence not only on light work but in suggesting methods of handling heavier work. Electric drive has now been generally introduced, and simultaneously have come more efficient pneumatic systems. Dark, cluttered, ill-arranged shops have given place to clearly lighted or illuminated, orderly plants, in which the work moves as nearly as possible along well-planned lines and without confusion or retrograde motion. In short, the progress made of late augurs exceedingly well for the future.

### Commerce with Philippine Islands

According to a statement issued by the Bureau of Insular Affairs, the foreign commerce of the Philippines for the calendar year 1913 fell materially below that of the high record of 1912 in both imports and exports, but machinery and iron and steel articles showed a gain. In the increase in the various iron and steel items, it is stated that sugar machinery took the lead, with a value of \$1,000,495 and the supplies for the reorganization of the sugar industry on a modern basis were chiefly from the United States and Hawaii.

The total imports into the islands amounted to \$53,312,786, being \$8,355,165 less than in 1912. A severe drought and a typhoon are said to be responsible for the falling off in general imports. Exports amounted to \$47,772,956, which was a reduction of \$7,011,782, as compared with the calendar year 1912.

In the distribution of the year's trade by countries, the import declines were in the original rice-producing districts. Purchases from the United States were materially larger and for the first time amounted to half the total trade. Following is a summary of the imports of iron and steel machinery, all other iron and steel articles, and corrugated roofing:

*Iron and Steel Machinery.*—United States, \$1,974,928, against \$1,421,737 in 1912; United Kingdom, \$604,942, against \$566,654 in 1912; other countries, \$791,352, against \$289,969 in 1912. Total, \$3,371,222, compared with \$2,278,360 in 1912.

*Corrugated Roofing.*—United States, 17,706,792 lb., valued at \$614,347, against 23,910,263 lb. in 1912, valued at \$723,368; other countries, 4,506,661 lb., valued at \$125,943, against 1,597,579 lb. in 1912, valued at \$48,360. Total, 22,213,453 lb., valued at \$740,290, against 25,507,842 lb. in 1912, valued at \$771,728.

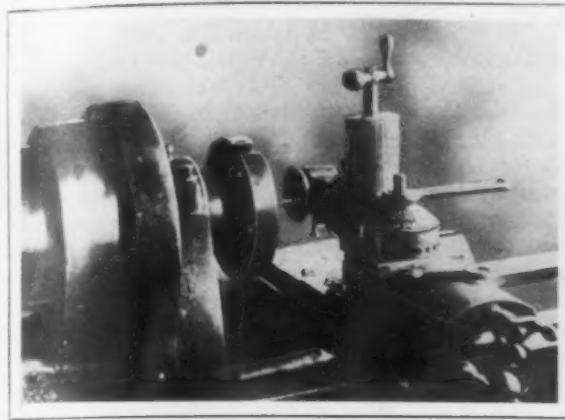
*All Other Iron and Steel Articles.*—United States, \$3,440,508, compared with \$2,120,672 in 1912; United Kingdom, \$410,575, compared with \$358,841 in 1912; other countries, \$651,309, compared with \$688,736 in 1912.

The Massillon Rolling Mill Company, Massillon, Ohio, has placed an order with the Alliance Machine Company, Alliance, for complete crane equipment for its new open-hearth steel plant. An order for an ingot stripper was placed with the Morgan Engineering Company, Alliance. The Alliance Machine Company has also received an order from the Pennsylvania Steel Company for an ore bridge, and from the Carnegie Steel Company for two bucket trolley cranes.

Lloyd's Register for 1913 shows that, exclusive of warships, 688 vessels of 1,932,153 tons gross, including 641 steamships of 1,919,578 tons and 47 sailing vessels of 12,575 tons, were launched in the United Kingdom in that year. Warships launched in both government and private yards amounted to 49, of 271,376 tons displacement, so that the total output was 737 ships, of 2,203,529 tons. The production of mercantile tonnage is the largest ever attained.

### Gear Cutting Attachment for Lathes

To enable milling, gear cutting and drilling operations to be performed in a lathe the Garrett Attachment Company, Fourteenth avenue and Clin-



Cutting Gears in a Lathe

ton street, Nashville, Tenn., has brought out a special attachment. In addition to facilitating work of this nature, the attachment can be used in connection with an upright drilling machine for drilling holes in plates or shafting where it is desired to have equal distances between them.

For cutting spur gears the attachment is placed on the lathe carriage with the lug in the T-slot of the carriage, while the T-bolt furnished with the attachment is tightened to hold it in place. The blank is mounted on the arbor of the attachment and the change gears, which will give the correct number of teeth, are put in position. After this has been done the attachment is raised by the elevating screw until the cutter is at the proper depth. The work is then fed under the cutter by the feed of the lathe carriage instead of moving the cutter to the work as is the general custom. Index plates are drilled by placing the attachment in position on the carriage and turning the table over so that the

spindle nose points toward the spindle of the lathe. The plate is then fed toward the drill with the rack feed until the desired depth of hole is bored. In cutting keyways the stock is fastened in position on the table with T-bolts and is fed up to the cutter



Drilling Index Plate Holes in a Lathe

or across under the cutter as may be desired. Angular and worm gears can also be cut, the swiveling to the desired angle being controlled by graduations on the base of the stand.

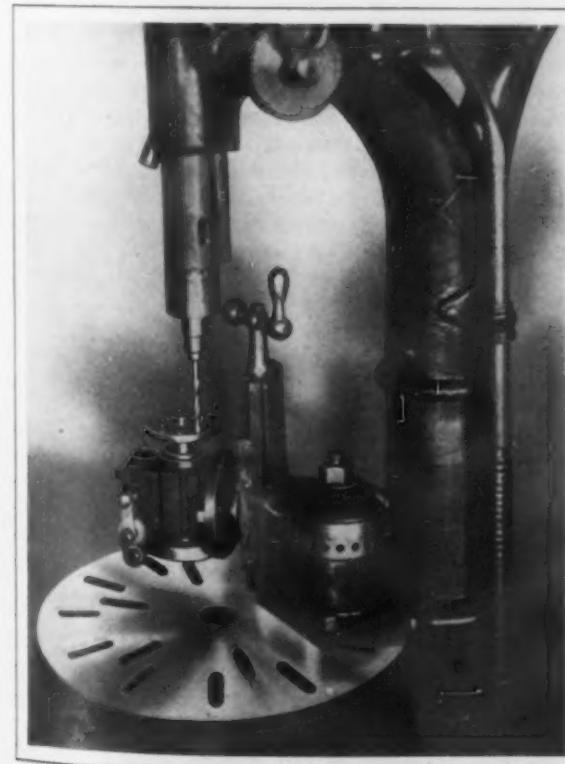
The attachment is designed and built especially for machine shops or where gears have to be cut, index plates made, and keyways or screw heads slotted and the amount of any particular operation is not sufficient to warrant the installation of special machinery. It is pointed out that the attachment can be transferred from a lathe to a vertical drilling, shaping or planing machine readily and without removing the work. Taps and reamers can also be ground in a lathe by the use of this attachment.

### Heat Treated Structural Steel

To heat treat structural steel will eventually be the common practice, in the opinion of James H. Herron, metallurgical engineer, Cleveland. He stated this belief in a recent paper read before the Cleveland Engineering Society. There seems, he said, to have been a tendency to increase the strength by increasing the carbon and manganese, but this is hazardous in the face of possible dynamic stress, and it is much better to use a little extra material and keep the carbon content in the medium range. The elastic limit should be considered the real measure of strength of any steel, he added. Nickel steel of above 0.25 per cent. carbon is becoming popular, as this steel has a value of from 15,000 to 20,000 lb. unit value over carbon steel of similar composition.

The Consolidated Expanded Metal Companies, Pittsburgh, Pa., has issued a pamphlet calling attention to its Steelcrete guards for machine tools. These guards are made of a cold-drawn mesh, fabricated from open-hearth steel, and standard angles and sections. As the material is a single sheet, it is stated that it is impossible to unravel the strands or distort the diamond mesh. Among the particular features of these guards are accessibility of the protected parts if necessary by hinging a portion of the guard, ventilation of the moving parts of the machine and ability to see them and ease of oiling. The pamphlet contains a number of illustrations showing the great variety of the guards for metal working machinery, engines, shafting, etc., which can be constructed from this material.

The Gulf States Steel Company, Birmingham, Ala., has issued a special illustrated leaflet dealing with its basic open-hearth steel bars for reinforcing concrete. Lists of sizes are given, the bars being rolled in lengths up to 60 ft., twisted and plain.



Drilling a Series of Holes, Which Are Spaced at Equal Distances by the Attachment, in a Plate

# By-Products in Iron and Steel Manufacture\*

## The Progress of Twenty Years in Their Recovery and Application—Three Cleaning Systems for Gases Compared

BY ADOLPHE GREINER†

I shall pass over in brief review the numerous "by-products" of present-day metallurgy and collate the results obtained in this field, which is now being more and more cultivated. There is now, so to speak, hardly a single works of importance that does not consist of several departments closely linked together in interest and subject to a common control. Coke ovens, blast furnaces, steel works, with converters or open-hearth furnaces, rolling mills, and forges, constitute a harmonious whole to which all the parts contribute their co-operation in order to effect the greatest possible economy in working.

### RETOUR COKE OVENS

We have left far behind us the time when everything was sacrificed to the production of a beautiful, silvery, metallic-looking coke such as that of the celebrated beehive ovens of Durham, which formerly discharged into the atmosphere torrents of smoke, and at night lit up the skies and the vicinity at the expense of a proper yield of product. I remember, as the result of a communication made to this Institute in 1880 by one of the pioneers of the new coke ovens, one of your leading ironmasters remarking that it mattered little knowing how many tons of coke were burned per ton of pig iron, but that what did matter was to know how many tons of coal were consumed per ton of pig iron. He was quite right from his point of view, because it was true that the coke from the ovens to which he was referring was of poor quality and inferior to that from the beehive ovens, to which his own blast furnaces were accustomed.

Whatever system of coke ovens is employed, the essential condition is, of course, the production of a coke of the very best quality, but since 1880 great progress has been made, and from any of the modern coke ovens coke of the requisite quality may be expected and obtained.

### COKE-OVEN GAS

This gas, which is exceedingly rich in calories (3700 to 4000 per cu. m.) was formerly used almost exclusively in heating the coke ovens themselves, being carried away by flues beneath the bottoms of the retorts or between the walls, and burned with the aid of unheated air admitted through openings on the outside. The burnt gas passed under boilers, when it served to produce fairly approximately the amount of steam required for the ovens and for the manufacture of sulphate.

It is somewhat astonishing that so many years should have passed before the advantages of burning the gases by heated air should have been taken into consideration. Thanks to regeneration, 50 per cent. of the gas is, as a matter of fact, saved, and it is permissible to say that the saving will not stop at this, and that the important heat losses, due to charging the coal and to the discharging and quenching of the coke will also be reduced. On

\*A portion of the presidential address of the new president of the British Iron and Steel Institute at its London meeting, May 7 and 8.

†Director-general, Société John Cockerill, Seraing, Belgium.

the other hand, if the process of the distillation of coal and of the heating of the walls and hearths of the furnace had been more accurately reasoned out, it would almost certainly have been recognized that the gas from coke ovens is of far too rich a quality to be employed for such purposes, and that it would be much better to reserve it for other metallurgical uses and to substitute for it a gas of poorer quality, yet sufficiently rich to produce the desired calorific effect.

It should also be noted that coke-oven gas, which is rich in methane, can only be employed in the cold state, as some of its most valuable elements of combustion are decomposed by heat. The following table shows the average percentage composition and heat values of the three gases most frequently employed in the industry:

Average Composition and Heat Value of Gases			
	Coke-oven gas	Pro-ducer gas	Blast furnace gas
Hydrogen	57	12	3
Carbon monoxide	6	19	26
Carbon dioxide	2	8	11
Methane	23	2	6
Nitrogen	12	59	60
Calories per cubic meter	3.761	1.068	0.873

These data, which vary at different works, are those obtained in the laboratory at Seraing. Now both experience and calculation show that the temperature of combustion of a mixture of producer-gas and air heated to 900 deg. reaches 1980 deg. C., which is practically equal to the temperature of combustion of a mixture of cold coke-oven gas with air heated to 600 deg., which reaches a temperature of 1940 deg. C. A mixture of blast-furnace gas and air, both heated to 900 deg., yields a temperature of 1920 deg. C. It follows, therefore, that if the gas from producers or from blast furnaces can be obtained cheaply, it is highly advantageous to use them for heating the coke ovens, and to reserve the richer coke-oven gas for other metallurgical uses.

With regard to the value of these different gases, in the particular instance of the Cockerill Works at Seraing, which are under my control, the following values have been arrived at:

Value per Cubic Meter of Gas in Pence	
Coke-oven gas (in open-hearth furnaces)	0.15
Coke-oven gas (for power purposes)	0.12
Purified producer-gas	0.7
Washed blast-furnace gas	0.3

### TAR, AMMONIUM SULPHATE, AND BENZOL

Some of the members here present can doubtless recall the chilling reception accorded on the occasion of the meeting in 1880 to the paper by Henry Simon on the Carves ovens at the Bessèges Works of the Terre-Noire Company in France. This pioneer attack on beehive ovens achieved but a slender technical success in spite of the warm discussions which found echo in the Proceedings of the Iron and Steel Institute, and it was not until 1898 that Mr. Darby, on the initiative of the president, Edward P. Martin, reopened the question of the by-products of coke ovens. It is interesting to peruse once again the polite but guarded and mistrustful interest manifested in the results obtained at

Brym, and elsewhere. Further, the only by-products described by the author were the tar, the ammonium sulphate, and the steam.

In the present day numerous systems of coke ovens, from 1 ton of coke there is obtained from 25 to 40 kg. (55 to 88 lb.) of heterogeneous and viscid liquid tar, the commercial value of which constantly rises, and which is usually sent by the works to factories, where it is submitted to fractional distillation, to yield industrial oils of very varied composition. In default of petrol, the Diesel motor works well with these products, and may in the future become a large consumer; the aniline dye works are also an important outlet for some of these hydrocarbons, amongst which naphthalin is also included.

In the construction of roads a large quantity of tar is likewise employed, while what may become a fresh source of profit for the tar derivatives is the direct manufacture of pitch for the progressive industry of the briquetting of fuels. Nearly one-half of the tar treated is employed for this purpose. Within the last few years 80 to 90 per cent. of pitch, having a remarkably high agglutinative power and competing strongly with ordinary pitch, has been produced from the tar by a special process of oxidation. A works to carry out this process has been established near Liége, in Belgium.

#### TAR IN THE STEEL FURNACES AT GARY

In certain cases it is advantageous to use the tar as a combustible, with appropriate burners; it may even be used in metallurgical furnaces, as is done at the Gary works in the United States, where three open-hearth furnaces of from 90 to 100 tons capacity, heated by tar, have been at work for some time. The total quantity of steel manufactured in these furnaces during the year 1913 is given at 94,110 tons, and the average per cast at 94.2 tons. The mean consumption of raw tar is 34.94 gal. per ton. The steel made in the tar-heated furnaces was shown to contain 14 per cent. less sulphur than that produced by the other furnaces of the same battery, while the output was increased by 10 per cent. as compared with the average of the whole group.

After having been deprived of their tar, the gases deposit their ammonia in leaden troughs containing sulphuric acid; the ammonium sulphate thus formed represents a weight of 11 to 13 kg. (24 to 28 lb.) per ton of coke; the salt is perfectly white, provided that care is taken, by means of an ingenious arrangement, to prevent it being contaminated by the last traces of tar. It is worth about 30f. (24s.) per ton, is used chiefly as manure; its consumption continues to increase, and the 600,000 tons which were used in 1900 became 1,300,000 tons in 1912, and will exceed 1,500,000 tons in 1914. The production of natural Chilian nitrates, which amounts to 2,500,000 tons per annum, will not increase during the next few years, so that the ammonium sulphate from coke ovens has before it a future which is the more promising inasmuch as the demand for nitrogenous manures will undoubtedly continue to increase.

Finally, benzol is another by-product of the manufacture of coke, which has numerous uses; it yields on distillation the petrol (benzine) of the automobilist, and is used also as a solvent for india rubber; 6 to 7 kg. (13 to 15 lb.) are obtained per ton of coke.

Even after all this there remains, finally, the rich gas, the use of which in the early stages was restricted to gas engines at the expense of blast-furnace gas, but its high calorific energy naturally

predestines it to metallurgical uses in metal mixers, open-hearth furnaces, reheating furnaces, and similar employments. In these various applications the heating of the coke-oven gas is exceedingly simple; it is, of course, necessary to adjust the burners to the working hearth of the furnace, the dimensions of which are determined in accordance with the teachings of experience.

There is no more difficulty in running such a furnace than there has been in the United States in running furnaces on natural gas. In 1912 the United States consumed 15,750 millions of cu. m. of natural gas of 7000 cal., at an average price of 0.265 of a penny per cu. m., representing a total value of 417,000,000f. (£16,680,000).

The amount of gas evolved by a ton of coal may be estimated at 300 to 350 cu. m. (10,500 to 12,500 cu. ft.). After passing through the regenerative chambers this gas contains only a little sulphur dioxide and sulphuretted hydrogen, which it is necessary to eliminate, particularly when the gas is used in gas engines. This purification is effected by making the gas pass through layers of iron oxide spread in the chambers. It is advisable likewise to install a gasometer, not only because it allows of the composition of the gas and of the pressure at which it is delivered to the furnaces (which is highly important, particularly for the successful working of open-hearth furnaces) being rendered uniform, but also for storage purposes during the period when the steel works are stopped, such as from Saturday to Monday or during public holidays. Their cost price would soon be redeemed by the advantages to be derived from the additional quantities of gas rendered available. For example, the gasometer at the Cockerill Company's works cost 500,000 f. (£20,000), and has a capacity of 50,000 cu. m. Assuming that the open-hearth furnaces are working only 300 days per annum, it would serve for the collection as a minimum of  $65 \times 50,000 = 3,250,000$  cu. m. of gas of the value of 0.15d. per cu. m. The annual saving would therefore be at least 48,750 f. (£1948).

#### COKE-OVEN GAS FOR LIGHTING

Another use for coke-oven gas which is becoming current practice is the lighting of towns and works. The average lighting power of this gas is, however, lower than that of ordinary lighting gas, but this defect can be rectified by the use of Auer burners, which turn to advantage the calorific power. In any case, in order to satisfy the conditions of proper lighting, fractional distillation is employed. Enormous installations have been at work during the last few years in Westphalia under exceedingly severe specifications, which fix the calorific value at 5000 cal. and stipulate for guarantees of purity from ammonia, naphthalin, tar, sulphur, water vapor, carbon monoxide, and carbon dioxide. Some towns, such as Barmen, receive their lighting gas through mains 50 km. in length from the generating works; this town consumes 17,000,000 cu. m. per yr., at a price varying from 0.30 to 0.50 of a penny per cu. m., whereas town gas costs double.

In Belgium a number of coke works are preparing to light the towns, while the town gas works, when increasing their means of production, do so by the installation of coke-oven batteries rather than of retorts. In England there are several central gas works; among others, the works established some years ago by Mond, whose reputation is world-wide. In America a number of towns are at present lighted by coke-oven gas previously purified. Finally, there may be instanced as a possible

application for coke-oven gas the direct manufacture of nitric acid by the process actually investigated by Professor Häusser; also, it is being sought to obtain from these gases the hydrocarbons, the derivatives of which are found in India rubber, and certain experiments undertaken in this direction permit of the foreshadowing of the manufacture of artificial rubber.

#### BLAST FURNACE BY-PRODUCTS

In concluding his own excellent address, my esteemed predecessor, Arthur Cooper, recalled the remark made by our deceased friend, E. P. Martin, who, in his address in 1897, said: "It would almost appear as if pig iron would soon become a by-product. The chief work of the ironmaster of the future will be giving light and power to the country." To this witty prognostication Mr. Cooper added the following reflection: "It is clear that Mr. Martin in 1897 regarded this subject as a most important one, but it is far more important to us today, having regard to the great increase in the cost of coal which has already taken place, and the certainty of a still further increase in the near future." Let me add to that, "and to the strong depression actually existing in the price of pig iron itself."

I shall indeed be telling blast-furnace managers nothing new when I tell them that on the Continent, as in England, the price of pig iron has fallen during a twelvemonth by 20 to 25 per cent., and more than one furnace has to depend upon the resources arising from the employment or the sale of its by-products.

#### BLAST-FURNACE GASES

To give an idea of the improvement resulting from the use of washed gases, I may instance the fact that the stoves of one of the large blast furnaces of the John Cockerill Company became choked up generally after four or five months' working, and required complete cleaning out. After running for two years with gas, cleaned to the extent of 0.5 g. per cu. m., the same stoves have required no cleaning whatever, and may run two or three years longer without stoppage.

Numerous appliances have been invented for the purification of blast-furnace gases, which sometimes contain up to 20 g. of dust per cu. m.

For the purpose of comparing three important systems the following figures may be given; they are not to be considered, however, as determinative in the matter of the cost price per cubic meter of the gas:

System	Consumption of water per 1000 cu. m. in cubic meters	Power required per 1000 cu. m. in horse-power	Degree of purifi- cation per cu. m. in grammes
Zschokke .....	5	6	0.3 to 0.5
Theisen .....	3.5	4	0.08
Beth Halberg .....	0.02	2	0.01

The drying of the blast by the Gayley process does not furnish adequate results. It is necessary to seek to improve the combustion in the Cowper stoves by a more intimate admixture of gas and air, and, better still, by heating the air required for its combustion by means of regenerators, as is now done in the case of reheating furnaces and of coke-ovens. The production of cheap oxygen by the fractional distillation of liquid air probably carries with it in reserve, pleasant surprises. The trials carried out in Belgium in enriching the oxygen of the blast have been very encouraging.

We know, too, that given equal power, a gas-engine consumes less than half the amount of gas consumed beneath the boiler to supply even the most

perfect steam-engine, while most of the metallurgical works in Europe have made the installation of gas-engines the general practice. Such engines are now found in all countries, including Japan, China and the Indies.

The number of gas-engines at work of over 200 h.p. is estimated at over 900, representing an aggregate of at least 1,500,000 h.p., while to these figures must be added those in the United States of America. Belgium occupies a highly honorable place among the great industrial nations, with ninety-four gas-engines developing a total of 128,000 h.p. Within a few weeks there will be put into operation at Seraing the most powerful gas-engine hitherto constructed. It will develop 8000 h.p.

In the meanwhile the central power stations of metallurgical works continue to develop. Many such stations possess from five to ten gas-driven blowing-engines, and ten to fifteen motor generator sets developing sometimes an aggregate of over 30,000 h.p. They are fed with coke-oven or blast-furnace gas—sometimes with both—after complete purification. Experience has shown that, after six months' running, the dust deposits, even in the most tortuous windings of the cylinders, are scarcely appreciable, provided the gas does not contain over 0.025 g. per cu. m. On the other hand, if the cooling water is not too hard, the cleaning of the deposit from the cylinder walls need only be effected every second or third month.

Look, likewise, at the advantages that may be derived by the utilization of the gases, by combustion, on their leaving the engines; the 500 degrees of heat they carry off with them yield, in appropriate boiler plants, an amount of steam which can be used in machines of different descriptions, or, better still, in turbines. Careful experiments have established that by these means 10 to 13 per cent. of the effective energy of the gas-engine can be recovered.

#### SLAGS, CEMENT, BRICKS AND AGGLOMERATES

The gases are not the only by-products of pig iron; there are also the slags, the annual production of which is estimated at close on 200,000,000 tons. When the slags are acid they are made to serve for the manufacture of slag-wool, formerly employed as a heat-insulating packing, but since the bulk of the slags have become calcareous it has been in the direction of the manufacture of artificial cements that ingenuity has been brought to bear upon their employment. The cement industry has grown greatly of recent years. It is estimated that the annual European production of various slag cements reaches the figure of 1,000,000 tons, and this amount will not fail to increase. To this must be added the enormous output of the Steel Trust, whose cement works have just been considerably enlarged. The important development of the use of ferro-concrete further opens up to their use a promising future. Side by side with cements there is being carried out at many works the manufacture of bricks.

Another by-product which possesses importance is that derived from the heavy dust recovered from the dust-catchers, which has a composition closely approximating to the ores employed in the furnace burden. The amount varies greatly, according to the nature of the ores used. In some works, for example, those which employ a large proportion of the Lorraine ores, it may be estimated at 6 to 10 per cent. of the charge. Experiments have everywhere been made to agglomerate it and use it in this form in the blast-furnace. The cost of agglomeration varies from 2f. to 5f. per ton (1s. 8d. to 4s.), according to whether a binder is used, such as quick lime, calcium chloride, magnesia, etc., or whether

it is nodulized by roasting. As the material, when nodulized, possesses the value of the natural ore, the saving is considerable.

#### BY-PRODUCTS OF STEELWORKS

In his paper read before the Institute in 1887, Gilchrist, who at that time estimated at 400,000 tons the total slags containing from 17 to 20 per cent. of phosphoric anhydride produced during the year preceding, pointed out that out of a total of 2,500,000 tons of phosphatic manures consumed in the five largest countries using them, the proportion of slag already being used was of favorable augury for the future. He was not far wrong, for, according to a proximate calculation, the production of basic slag in 1913 must have attained close on to 5,000,000 tons, worth nearly 200,000,000f. (£8,000,000), distributed as follows:

#### Basic Slag Production in 1913

	Tons
Germany and Luxemburg	3,415,000
France	735,000
Belgium	500,000
Great Britain	325,000
Sweden, Russia, and Canada	80,000
Total	5,055,000

There are still in a modern steel works very many economies to be effected by the judicious application of the heat losses from the converter itself down to the smallest mill-reheating furnace. Who can say that our engineers will not some day solve the problem of recovering the enormous heat losses in the flames of the converter? Theoretically, per ton of coal there are 180,000 cal. available at the mouth of a basic converter, an amount which represents, on a daily production of 1000 tons of steel, the very respectable total of 180,000,000 cal. wasted into the atmosphere. This heat could be utilized beneath boilers, the steam from which could supply a turbo-blowing engine. A calculation will show that its complete recovery would yield 40 h.p. hr. per ton, which corresponds with 2000 h.p. available permanently for a steel production of 1000 tons per 20-hr. day. Two thousand horse-power! That is nearly the power of the blowing-engine, and the refining of the pig iron could thus be effected without the expenditure of any further calorific energy!

Not more than 132,000 cal. are needed to raise the temperature of a ton of steel from 0 to 1200 deg. C., the temperature of rolling. Now, a furnace charged with cold ingots requires, roughly speaking, 125 kg. (2½ cwt.) of coal to raise it to the temperature of rolling—that is to say, 875,000 cal. The loss, therefore, is 85 per cent.! And how many furnaces are there which are even more wasteful. Really, we metallurgists must sometimes feel absolutely ashamed to quote certain figures!

If a metallurgical works produced itself in regenerative coke-ovens all the coke required for its blast-furnaces, if it manufactured bricks and cement from its slag and found in its steel works application for all the available gases, either in its open-hearth and its reheating furnaces, or in the production of motive power, it would effect per ton of pig iron, profits which may in detail be shown as follows:

	Yield.
	s. d.
Slag-ovens per ton of coke	Sulphate, tar, and benzols.
Blast furnaces per ton of pig iron	200 cu. m. of gas at 0.12d.
	2 0
	Cement, bricks, and slag
	1250 cu. m. of gas at 0.03d.
	0 7 ½
	Recovery of dust
	3 1 ½
Total per ton of pig iron	9 6
By per ton of steel ingots	11 2
By per ton of rolled steel (rails, girders, sections, bars)	12 6

Without taking into account the profits yielded by the sales of the basic slag. What an income for him who would know how to realize it!

I have sketched a sufficiently complete outline of the progress realized during some 20 years in the recovery and application of the by-products of steel works. Will that progress stop where it is? I doubt it. Every improvement leads to a fresh one, and each day sets the goal of progress further ahead. Just as electricity has permitted of the centralization of motive power and of its economical distribution, so the centralization of the resources of metallurgical gases and their ready transport to the various points of their utilization bestow upon metallurgical works enormous advantages. To the huge saving in fuel which results from the utilization of coke-oven and blast-furnace gases for the production of motive power must be added those which are realized by the numerous applications of heating. The study of suitable burners, the general employment of efficient reheaters, and the means of perfect adjustment and complete control will conduce to even greater saving. Finally, the cost of labor and the running expenses, other important factors of the cost price, are similarly reduced to a proportionate extent. By these means our metallurgical industries succeed not only in producing cheaply, for the general need, but they show themselves provident in safeguarding for future generations the wealth that nature has, with great generosity, but not inexhaustibly, implanted in the soil.

#### APPENDIX—CALCULATION OF AVAILABLE GASES

*Coke Ovens.*—1 ton of coal yields 300 cu. m. of gas; therefore, there is obtained per ton of coke,

$$\frac{300 \times 100}{75} = 400 \text{ cu. m. (14,126 cu. ft.)}$$

In modern regenerative ovens half the gas is available = 200 cu. m., or 7060 cu. ft. Its value ranges from 0.12 to 0.15 of a penny, according to the use made of it. The whole of the available gas can be utilized, for it is possible to store up in gasometers the output made during periods when the steel works is stopped.

*Blast Furnaces*—One ton of pig iron requires for its production 1 ton of coke, and 1 ton of coke yields 4500 cu. m. (159,000 cu. ft.) of gas, of which 40 per cent., or 1800 cu. m. (63,500 cu. ft.), is available. The gas is, however, lost during the stoppages of the steel works, because its volume is too great to be stored, and in practice only 1250 cu. m. (44,000 cu. ft.) can be utilized. Its value is 0.03 of a penny per cu. m.

The Alliance Structural Company, Alliance, Ohio, which was recently organized with a capital stock of \$200,000, was formed to fabricate girders for the Alliance Machine Company and to do a general fabricating work in structural material. It will soon have its plant under way. It is closely affiliated with the Alliance Machine Company, several of those interested in that company being also associated with the new one. G. W. Shem is president; G. G. King, secretary; M. S. Milbourn, treasurer, and B. J. Hier, general manager. Mr. Shem is secretary and engineer of the Alliance Machine Company and Mr. Milbourn is treasurer. Mr. Hier, the general manager, who is also financially interested in the new company, was, until recently, general manager of the Mt. Vernon Bridge Company, Mt. Vernon, Ohio.

Corrigan, McKinney & Co., Cleveland, Ohio, have placed an order with the Babcock & Wilcox Company for 28 Sterling and B. & W. high pressure boilers for the power plant to be erected in connection with their new steel plant in Cleveland. The boiler capacity to be supplied amounts to 24,000 hp. Most of the units will be of 800-hp. capacity.

FER & SONS.  
Mechanical and Civil Engineers.  
PITTSBURGH, PA.

ESTABLISHED 1855

# THE IRON AGE

Published Every Thursday by the DAVID WILLIAMS CO., 239 West Thirty-ninth Street, New York

W. H. Taylor, *Pres. and Treas.*

Charles G. Phillips, *Vice-Pres.*

Fritz J. Frank, *Secretary*

M. C. Robbins, *Gen. Mgr.*

BRANCH OFFICES—Chicago: Otis Building. Pittsburgh: Park Building. Boston: Equitable Building. Philadelphia: Real Estate Trust Building. Cleveland: New England Building. Cincinnati: Mercantile Library Building.

Subscription Price: United States and Mexico, \$5.00 per year; to Canada, \$7.50 per year; to other foreign countries, \$10.00 per year. Entered at the New York Post Office as Second-class Mail Matter.

## EDITORS

GEO. W. COPE

A. I. FINDLEY

W. W. MACON

CHARLES S. BAUR, *Advertising Manager*

## Will Iron Be the Barometer?

The opinion has been widely prevalent in iron and steel trade circles in the past few weeks that an improvement in industry as a whole would be necessary before the iron trade could show any measurable movement toward recovery. According to the temperament of the individual this general view has been more or less colored. Some have maintained that industrial prosperity required the fillip which would be given by a decision favorable to the railroads in the Eastern rate case. Others have regarded the Mexican trouble as one of the foremost difficulties. A great many have regarded a more lenient attitude of the Government in the trust question as necessary to any revival in industry. Still others have expressed the view that industrial and financial conditions abroad must improve before we can have a definite and decided improvement in the iron and steel industry.

Through all the variously expressed views there runs the common thread that the iron and steel market cannot improve materially until aid comes from the outside, for the bars to progress which have been mentioned do not apply exclusively, or even in particular, to the iron trade. The difficulties of the railroads have, of course, a close bearing, but the opinion has frequently been expressed that permission given the Eastern roads to advance rates would bring more orders from outsiders than from the railroads themselves. The Mexican trouble, of course, has little to do directly with the iron trade. As to the trust question, the iron trade has relatively little direct concern, seeing that it is two and a half years ago that suit was brought for the dissolution of the United States Steel Corporation, and the market has had a complete rise and fall in the interim. As to financial and industrial conditions abroad the American iron and steel industry has hardly any more direct concern than have other American industries as a whole. It is true our iron and steel exports have decreased, but we have never depended to any great extent upon that business for our prosperity.

It used to be a generally accepted dictum that iron is the barometer of industry, which means that the iron industry will experience a discernible improvement before improvement can be discerned in other branches of human activity. The function of a barometer is to foretell weather changes, the thermometer, anemometer, etc., merely indicating a condition existing at the moment. If iron is to be the barometer of trade at the time of the next change, the iron and steel market must reflect an improvement before such improvement can be ob-

served in trade generally, and this would be distinctly out of harmony with the views commonly held of late that the iron market cannot improve until trade generally improves.

It is clear that the technical position of the iron and steel market has much to do with the question whether it is quick or slow to respond to influences in trade generally which are making for improvement or the reverse. Sometimes, as in 1908, prices are relatively high and buyers are discouraged when at low prices they would be disposed to take hold more quickly. Sometimes, as at the beginning of 1907, the mills are filled with orders which ought to have been shipped earlier, and the industry is slow to feel the general impulse. Sometimes, as in the spring of 1910, buyers are well loaded with stocks and mill production and shipments may decrease when the actual consumption of the country is tending rather to increase.

At the present time the technical position of the iron and steel industry is peculiarly favorable to a recovery. It is universally admitted that stocks throughout the country are extremely light. Prices are admittedly very low, a fact attested by common knowledge as well as the very poor earnings reports lately made by steel producers. There is no fear in the minds of buyers of a possible "break" in prices, for a break means dollars per ton and in no important commodity is there a margin of dollars per ton between the average cost of production and the current selling prices. There is no deadlock between buyers and sellers. In the retrospect it is clear that there was such a deadlock in 1911, since for a period of several months in that year production increased while prices sagged, while when a low point in prices was finally reached the orders became larger than ever. In the early stages of the improvement in demand the orders of buyers were restricted as much as possible; later they took hold with confidence.

If conditions were ever ripe for the iron market to be the barometer of trade generally they are ripe now, and it may easily be that instead of the future showing an iron market trailing behind other markets in a recovery, as seems to have been commonly expected of late, there will instead appear in the iron and steel industry itself the first clear indications of a general revival in business activity. The preponderance of sentiment is that such a general revival will eventually come, the more debatable question being where the first signs of the revival are to be sought. If they be found in the iron industry there will be merely another instance in support of the "barometer of trade" theory.

### The Railroad Rate Increase

After nearly eight months devoted to the consideration of the propriety of increasing by 5 per cent. the freight rates in Eastern classification territory, the Interstate Commerce Commission on May 2 took the matter under advisement following elaborate arguments on behalf of both shippers and carriers, and it is the opinion in Washington that this important issue will be finally determined before the end of the present month. It is safe to say that at no time since the commission was organized has there been before it a case of greater importance to the country at large or that has aroused more widespread interest. The record is of almost unprecedented bulk, and, while the commission has frequently devoted several months after the close of arguments to the consideration of far less important cases, the great desirability of an early decision of this case is so generally recognized and has been so strongly urged upon the commission, not only by the parties to the proceeding, but even by the President of the United States, that all other matters will be temporarily set aside by Chairman Harlan and his associates in order that the railroads and all other interests depending thereon may be relieved of uncertainty at the earliest practicable moment.

When the commission met early last week to hear arguments on the evidence it was significant that every member of the body was present, and the proceedings were followed by all the commissioners with the closest attention. The representatives of the railroads confined themselves closely to the record, presenting brief summaries of the elaborate statements put in evidence to show that the railroads today are laboring under heavy burdens put upon them by State and Federal legislation, by increased wages and by high prices of many important items of maintenance. The arguments based on these salient facts were exceedingly forceful and obviously made a deep impression on the members of the commission.

The opposition of the shipping interests to the proposed 5 per cent. advance can fairly be described as half-hearted. As in the case of much of the testimony against the desired increase, these arguments dwelt on alleged inequalities and discriminations in existing rates rather than upon the direct issue as to the propriety of the proposed increase. Perhaps the most significant statement during the course of the argument was made by Louis D. Brandeis, special counsel for the commission in these cases. Though opposing the 5 per cent. advance, Mr. Brandeis reluctantly admitted that "the net income and operating revenues of the Eastern railroads at the present time are smaller than is consistent with their assured prosperity and the welfare of the community."

While all opinions concerning probable action by the commission are necessarily speculative, it is the belief of those who have followed these proceedings most carefully that it will order substantial increases in existing tariffs, but probably will not concede a horizontal 5 per cent. advance in all rates. The increase in the carriers' revenues as the result of the curtailment of illegal free services, such as those covered by the Industrial Railways case, will be taken into account. These services have already

been cut off so far as they apply to iron and steel manufacturers. Tariffs eliminating similar services to large shippers in other industries have been filed by the carriers, but suspended by the commission upon protests by the manufacturers affected thereby. There is little doubt that ultimately all the services criticized by the commission in the Industrial Railways case will be cut off by all roads throughout the country. The elimination of these items, however, will not meet the deficit of which the carriers complained, and it is the best opinion in Washington that the commission will authorize increases in rates to an extent that will be fairly satisfactory to the carriers and in no way burdensome to shipping interests.

### The Farmer's Responsibility

In addressing the American Cotton Manufacturers' Association in New York last week Frank A. Vanderlip, president of the National City Bank, compressed many voluminous explanations of the country's present troubles into this sentence that will bear repeating:

As a nation we have for some years been attacked by a hysteria of criticism against big business, until a majority of the people have come to believe that the way to secure prosperity is through legislation, instead of through intelligent hard work, improved methods, and a scientific application of the best knowledge to their own business.

A large majority of the American people have been made to believe in the past few years that if the tariff were cut down sharply the cost of living would quickly come down, the trusts that had so long fattened on the people would be punished by loss of profits, and all big business would be humbled and in time chastened into good conduct. An extra session of Congress went to work—for the people's business required haste, and relief could not come too soon. Seven months have passed since the remedy was applied and there are no visible signs of a reduction in the cost of living except in certain prostrated industries, such as those producing nails, wire and the like. Many incomes have been cut down and tens of thousands of pay envelopes have been reduced to half their former contents.

And all the time the cry for increased efficiency has gone up against railroads and all big business, while the farmer's responsibility for the high prices of the necessities of life has been ignored. Mr. Vanderlip justly says:

If a railroad manager is culpable and is answerable to society for anything less than 100 per cent. of efficiency, what of the farmer and planter, holding the great agency of production—land—and utilizing it with but 40 per cent. of efficiency? That is the indictment that stands against no small part of the agricultural community—a conduct of their business on a basis of 40 per cent. of efficiency. Farmers and planters also owe something to society in the way of intelligently conducting their business. They hold the means of production in their control. The public interest and the common good demand that they exercise that trust with intelligence, efficiency and thrift, quite as rightly as does public opinion demand efficiency and honesty in business administration. Prices of produce go up in answer to the inexorable law of supply and demand: values of the great agency of production—farm lands—have risen in our memory 200 or 300 per cent., not because those lands were more efficiently managed, but because the demands of hungry mouths and backs to be clothed have made prices that permitted much increased values, even when not accompanied by increased efficiency of management.

Instead of the quick process it was thought to be, the lowering of the prices of those things which

enter into the cost of living will be gradual if it comes at all. Industrial depressions will come and go, and prices of manufactured products will rise and fall, but the problem of greater farm efficiency will long be with us. Some of the energy now lost in the agitation for laws against business may well be devoted to ways and means of increasing the country's crops, removing in part at least a fundamental cause of the high cost of living.

### Lake Superior Ore Prices

The iron trade is likely to take no more than a perfunctory interest in the announcement of season prices for Lake Superior ores as made in the past week. The return to the 1912 schedule, involving reductions of 65 cents and 55 cents on Bessemer and non-Bessemer ores from the 1913 basis, had been fully expected in the trade. Indeed, the fact so much advertised of late that the merchant furnace men of the North have been selling their pig iron at a loss of more than a dollar a ton really represents more than anything else a discounting of this ore reduction, or in other words a writing upon the ore pile of a depreciation commensurate with the prospective cost of replacement. While the blast furnace men have accepted the maligning of their business principles with very good grace a word in their defense may not be entirely amiss. They have really had no recourse in the past few months from valuing their unconsumed ore upon this basis, and the discovery that pig iron has been sold at an apparent loss is therefore not as important as has been made to appear in some quarters. For, let it be assumed that the furnaces had been able to maintain prices for pig iron which would return them the cost of their 1913 season ore, what would prevent their continuing to obtain those prices and thus make a profit on their later product equal to the present reduction in ore prices?

It is equally unfortunate for the ore producer and the ore consumer that ore prices should fluctuate as they do. It has been recognized for years that the chances are for an advance in ore to be followed by a decline in pig iron, and for a reduction in ore to be followed by an advance in pig iron. This is not because there is any relation of cause and effect, but because pig iron prices do rise and fall and in the nature of things the sellers of ore must base their prices more upon what has occurred than upon what is going to occur. In company with others in the iron and steel industry the ore producers know relatively little about the latter.

Taking Bessemer pig iron at Valley furnaces as fairly representative of fluctuations in pig iron made from Lake Superior ores, there have been five great peaks in the curve of prices in the past 15 years, and it must be more than a mere coincidence that in four of the five instances the announcement of ore prices was practically coincident with the attainment of the highest prices. The first high point in the period was December, 1899, and in that very month ore prices for the 1900 season were announced. The next was in November, 1902, but in that case the ore announcement did not occur until the following March. The third peak was in December, 1906, and it was in the preceding month of November that the ore price announcement was made. Next came a high point in November, 1909,

a price of \$19 being maintained for three months, or into the following February, and the ore price announcement was made December 24. Finally, a high level of \$17.25 was attained late in November, 1912, continuing until the following April, and ore prices were announced on November 19.

In each of these instances the announcement of ore prices involved an advance for the new season, and in each instance also there was a marked and somewhat early decline in pig iron. Assuming that the ore sold at the prices would last to the June following the season of shipment, and no longer, the average decline in Bessemer pig iron during the periods was \$6. The smallest decline was the most recent, from \$17.25, Valley, on November, 1912, when the 1913 ore price announcement occurred, to \$14 at present, when much of the ore then sold is still to be consumed.

A comparison of low ore prices and late openings would not make as uniform a showing of advancing pig iron prices following a reduction in ore, but material for argument would not be found entirely lacking. The 1912 ore prices, for instance, were fixed in March of that year, at reductions of 65 to 75 cents, and it was precisely in that month that the notable advance in pig iron prices began. The 1909 ore prices did not involve a reduction, but a continuance of the reduced prices of 1908, and the 1909 announcement was made on May 10, 1909, precisely the time when pig iron prices were lowest. Even in the following month of June the rising tendency was such as to attract general notice.

It is to be recognized, of course, that Lake Superior ore prices are not as important an item in the iron trade as was the case years ago. The great majority of ore consumers produce ore, and no small part of the ore buying and selling is in substance an interchange, through a consumer selling one kind of ore and buying another kind, while there are many transactions between companies having many common stockholders. There remain, however, many furnace interests which are merely consumers of ore. They would like to see low ore prices, but they are fully as anxious to see high pig iron prices. The chief inconvenience is the one made by nature, requiring that ore must be mined and shipped prior to December when it is not to be used until the following April or May. To shorten as much as possible the period of uncertainty a late fixing of ore prices is desirable and on a general average the tendency in recent years has been in the direction of later openings of the ore market.

### Iron Ore on Lake Erie Docks May 1

CLEVELAND, OHIO, May 6, 1914.—(By Wire).—The stocks of iron ore on Lake Erie docks May 1 amounted to 5,723,717 tons, as compared with 5,456,714 tons a year ago.

The Hazard Mfg. Company, manufacturer of wire rope and insulated wires and cables, has removed its New York office and warehouse from 50 Dey street to 533-541 Canal street.

The Wall Street Journal says: "It might be worse. What if the Interstate Commerce Commission were asked to decide whether our marines in Mexico needed more ammunition?"

## CORRESPONDENCE

## Can the Foundry Keep Promises Without Affecting Tonnage?

*To the Editor:* The observations of the writer on this subject cover a period of 13 years while directly and indirectly connected with steel foundries. Many foundrymen contend that it is impossible to keep promises of delivery without affecting tonnage; others that it is impossible to keep such promises whether you affect tonnage or not, due to the uncertainties and contingencies which arise over which there is often no control.

Undoubtedly this problem is becoming more serious on account of the exacting demands of the trade. Many castings that formerly were made of malleable iron and other metals are now specified in steel, and many designs that were formerly made as forgings are now made as castings. Castings that were made solid are now cored. Sections of metal have been cut down greatly. Extra metal for finish has been cut down to such an extent that the least defect causes condemnation. Specifications calling for various requirements also enter into the matter very seriously, particularly as regards the requirements of the various railroads, hardly two being alike. In addition, the trade has a habit of constructing its patterns in accordance with its own ideas, necessitating alteration on their arrival at the foundry in order to make them suitable for foundry practice.

Taking these conditions into consideration and recognizing the fact that many foundries have one or two customers that take from one-half to two-thirds of their output who must be taken care of, it leaves what would seem the impossible task of keeping a very large percentage of the promises made.

Various methods of keeping promises have been introduced, but I am fully convinced from actual experience that a follow-up system is possible which will bring about the desired result.

The most essential feature for the success of a follow-up system in the foundry is that one man should have unlimited power. He should have authority to make promises. He should lay his work out systematically, having it so arranged that the work necessary to complete each operation will come before him automatically the day before it is to be executed. From this record he should specify in writing to the various foremen his requirements for the following day. This gives the foreman an opportunity to plan his work, and eliminates the possibility of his own calculations being upset. His records should be clear to anyone who may require information on the subject of future delivery of promised work without causing confusion in the case of his absence.

It is a well-known fact that the orders that worry a foundry are those that call for small and intricate castings, those that call for annealing and inspection, the breakdown jobs, special work, etc. The castings that make tonnage rapidly take care of themselves. The foremen, in general, should understand that the requirements as called for are wanted because they are promised by the promissory clerk, who is the mouth-piece of both the trade and the management, and that nothing should interfere with the execution of the work as listed without the approval of the clerk referred to. At the end of each day's work the foreman notes on the list the work that has not been completed, gives reasons for delay, signs and returns it to the office. In all cases this list is approved by the promissory clerk; when not satisfactory to him it is sent to the manager. As the majority of foremen have their clerks, the follow-up system as described would not require any clerical work on their part.

The success of the method described depends solely on the promissory clerk and the support he receives from the management. In planning his work he must use great caution; in making his promises he must name specific dates. He must be careful not to promise more

## CONTENTS

Cost of a Shop Photographic Department.....	1117
Safeguarding the Soda Tank.....	1119
Information for Exporters.....	1119
Bolivia's Tin Resources and the United States.....	1120
Built-Up High-Speed Steel Cutting Tools.....	1124
New Steel Sheet Piling Corner Section.....	1125
Pacific Coast Metal Trades Association.....	1125
Strains in Rolled Brass and Bronze Bars.....	1126
The Jones "Step" Process at Date.....	1129
Dynamic Properties of Steel Castings.....	1130
Johnson Electric Smelting, Incorporated.....	1131
A Recently Developed Type of Nut Lock.....	1131
German Exports in March.....	1131
An Iron and Brass Foundry for Chicago.....	1132
Electric Steel Castings in England.....	1133
Highest Power Locomotive.....	1133
Successful Profit Sharing.....	1133
Standardizing Motors for Machine Tools.....	1134
An Automatic Cold Process Nut Machine.....	1135
Recent Advances in Expense Distribution.....	1136
A New Alternating-Current Tachometer.....	1138
Welding of Steel Barrels.....	1139
Proposed National Bureau of Employment.....	1139
Largest Coal Handling Plant in the World.....	1140
Properties of High Speed Steels.....	1142
Accidents as Related to the Time of the Week.....	1143
Vacuum Lifting Device for Power Presses.....	1143
Modern Practice in Structural Shops.....	1144
Commerce with Philippine Islands.....	1146
Gear Cutting Attachment for Lathes.....	1147
Heat Treated Structural Steel.....	1147
By-Products in Iron and Steel Manufacture.....	1148
Will Iron Be the Barometer?.....	1152
The Railroad Rate Increase.....	1153
The Farmer's Responsibility.....	1153
Lake Superior Ore Prices.....	1154
Iron Ore on Lake Erie Docks May 1.....	1154
Correspondence .....	1155
A Loss of 18 Furnaces.....	1156
Mechanical Engineers' Spring Meeting.....	1157
Blast Furnace Notes.....	1157
The Iron and Metal Markets.....	1158
New Foundry in Newark.....	1171
Economics of a Manufacturing Business.....	1172
Personal .....	1174
Pittsburgh and Nearby Districts.....	1175
Obituary .....	1175
Our Trade with Mexico.....	1176
Pennsylvania Steel Company's Report.....	1176
German Ferromanganese Costs.....	1177
Book Reviews .....	1177
The Machinery Markets.....	1178
Judicial Decisions .....	1187
Trade Publications .....	1188

work on any one date than the shop can accomplish. He should leave when possible one day a week blank in order to care for defective castings, etc. Also he should avoid promising any work on the last three days of the month, when the getting out of weight is emphasized.

The cost of a method such as here described is insignificant when the reducing of complaints, cutting out of extra correspondence, and the satisfaction and help it will give the salesmen in obtaining new work, are considered. This method will not affect tonnage by decreasing it. If anything it will increase it, as in many cases an extra effort is required on the part of the foremen to get the work out on time. And after all, foundrymen will agree that, at some period during the executing of 75 per cent. of all orders, an extra effort is often required before the order is completed, either brought about by the pressure of urgent correspondence, or a personal plea from the trades representative. While connected with the foundry directly, my experience was that the effort had to come first or last, and that it paid to start at the foundation instead of having the effort forced by strenuous protests from the trade.

MEDIA, PA., April 14, 1914.

R. E. WOOD.

## A LOSS OF 18 FURNACES

April Pig-Iron Output, 2,269,955 Tons

## Curtailment of Production Comes Toward the End of the Month

The country's April production of coke iron amounted to 2,269,955 gross tons for the 30 days, or 75,665 tons a day, which compares with 2,347,867 tons in the 31 days of March, or 75,738 tons a day. The April output is larger than was expected in view of the number of furnaces recently blown out; but the curtailment, which was very largely in the steel works furnaces, came late in the month. Under these conditions the figures showing capacity active May 1 are the real index to what is going on, rather than those of production in the past month. The net loss in active furnaces in the month was 18, there being 229 in blast on April 1 and 211 on May 1. The capacity in blast May 1 represented a production of 71,095 tons a day as against 76,111 tons a day one month previous, a falling off of 5000 tons a day, or at the rate of 1,825,000 tons a year.

## DAILY RATE OF PRODUCTION

The daily rate of production of coke and anthracite pig iron by months, from April, 1913, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons		
Steel works	Merchant	Total
April, 1913 . . . . .	64,658	27,101
May . . . . .	64,232	26,807
June . . . . .	62,002	25,617
July . . . . .	59,362	23,239
August . . . . .	59,140	22,981
September . . . . .	60,941	22,590
October . . . . .	59,630	22,503
November . . . . .	52,434	22,019
December . . . . .	41,879	22,108
January, 1914 . . . . .	40,691	20,117
February . . . . .	47,479	19,974
March . . . . .	54,990	20,748
April . . . . .	54,508	21,157
		75,665

## OUTPUT BY DISTRICTS

The accompanying table gives the production of all coke and anthracite furnaces in April and the three months preceding:

## Monthly Pig-Iron Production—Gross Tons

	Jan.	Feb.	Mar.	Apr.
	(31 days)	(30 days)	(31 days)	(30 days)
New York . . . . .	101,966	100,802	135,166	111,200
New Jersey . . . . .	11,341	10,155	9,997	10,888
Lehigh Valley . . . . .	79,263	66,377	77,616	75,872
Schuylkill Valley . . . . .	55,831	41,071	49,207	68,476
Lower Susquehanna and Lebanon Valley . . . . .	37,814	32,751	37,921	41,493
Pittsburgh district . . . . .	441,688	473,108	570,648	529,371
Shenango Valley . . . . .	85,076	102,590	141,469	125,736
Western Pennsylvania . . . . .	127,011	107,847	117,171	113,979
Maryland, Virginia and Kentucky . . . . .	37,603	30,235	60,305	61,694
Wheeling district . . . . .	83,193	92,076	123,113	113,467
Mahoning Valley . . . . .	165,881	174,692	229,923	241,254
Central and Northern Ohio . . . . .	155,503	164,741	187,110	167,520
Hocking Val., Hanging Rock and S. W. Ohio . . . . .	41,880	30,389	33,414	34,058
Chicago district . . . . .	228,439	245,719	317,603	305,718
Mich., Minn., Mo., Wis. and Col. . . . .	64,173	63,145	78,560	75,680
Alabama . . . . .	157,616	136,378	159,883	142,985
Tennessee . . . . .	16,776	16,594	18,761	18,604
Total . . . . .	1,885,054	1,888,670	2,347,867	2,269,955

## PRODUCTION OF STEEL COMPANIES

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in these figures, together with ferromanganese, spiegeleisen and ferrosilicon. These last, while stated separately, are also included in the columns of "total production."

## Production of Steel Companies—Gross Tons

	Pig, total production	Spiegeleisen, ferromanganese, etc.
1912	1,912	1913
Jan.	1,483,153	1,981,560
Feb.	1,550,995	1,792,154
Mar.	1,827,792	1,904,878
Apr.	1,830,717	1,939,751
May	1,922,557	1,991,192
June	1,823,958	1,860,070
July	1,803,205	1,840,216
Aug.	1,843,404	1,833,352
Sept.	1,773,073	1,828,232
Oct.	1,947,426	1,848,634
Nov.	1,884,524	1,573,007
Dec.	1,976,870	1,298,262

## CAPACITY IN BLAST MAY 1 AND APRIL 1

The following table shows the daily capacity, in gross tons, of furnaces in blast May 1 and April 1, by districts:

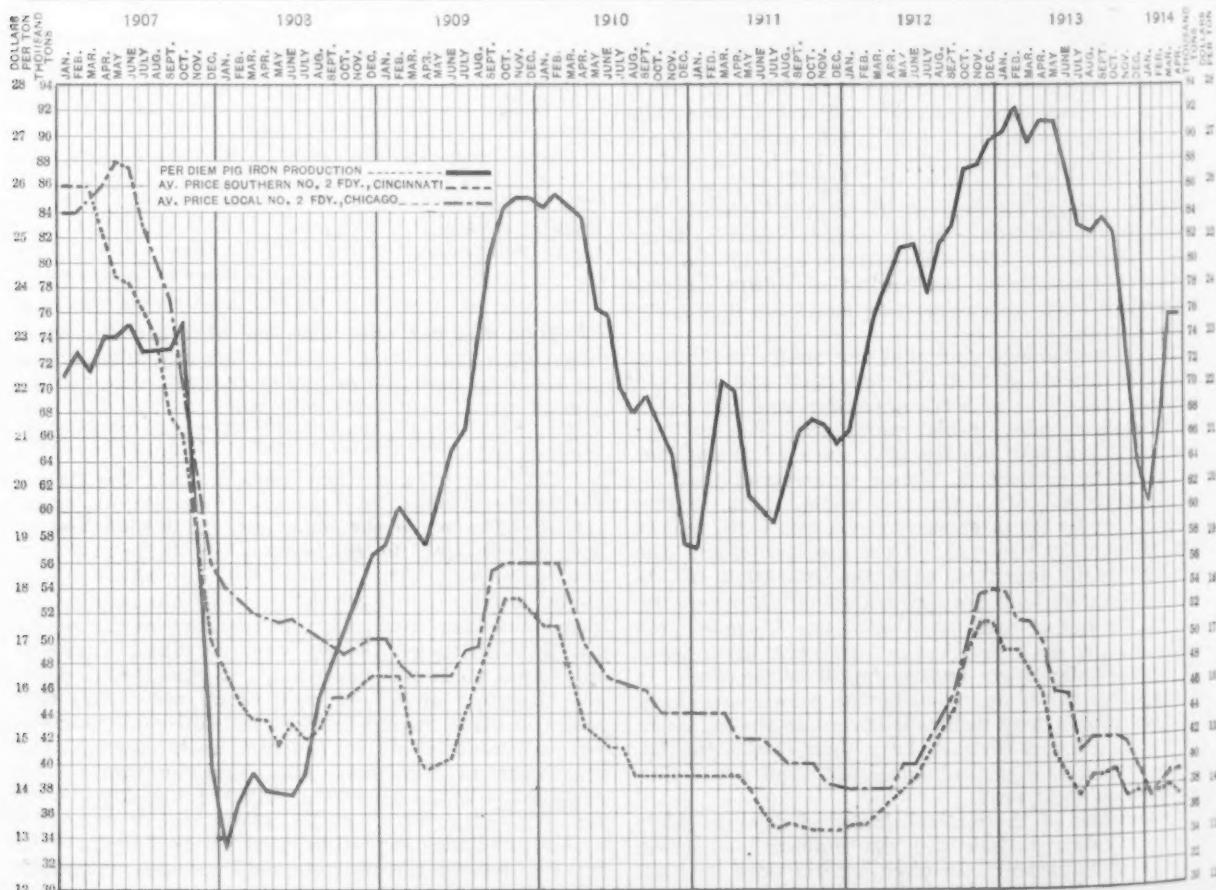


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from January 1, 1907, to May 1, 1914; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

## Coke and Anthracite Furnaces in Blast

Location of furnaces	Total number of stacks	May 1-		Apr. 1-	
		Number in blast	Capacity per day	Number in blast	Capacity per day
<i>New York:</i>					
Buffalo	19	13	4,576	13	4,395
other New York	7	2	350	1	150
New Jersey	7	2	362	2	322
<i>Pennsylvania:</i>					
Lehigh Valley	22	6	1,885	9	2,630
Spiegel	2	2	166	2	162
Schuylkill Val.	16	8	2,281	8	1,684
Lower Susquehanna	7	3	709	3	690
Lebanon Valley	10	4	674	4	653
Pittsburgh Dist.	52	34	15,455	40	18,255
Spiegel	4	2	262	2	251
Shenango Val.	19	10	3,655	14	4,634
Western Penna.	27	13	3,799	13	3,780
Maryland	4	2	856	2	630
Wheeling Dist.	14	8	2,942	11	4,036
<i>Ohio:</i>					
Mahoning Val.	25	18	7,495	19	7,885
Central and Northern	24	13	5,170	15	5,940
Hocking Val., Hanging R'k, & S. W. Ohio	15	9	1,135	9	1,110
Ill. and Ind.	34	21	10,015	20	9,680
Spiegel	2	1	156	2	221
Michigan, Wis. & Minn.	10	7	1,813	6	1,761
Col. Mo. & Wash.	8	2	709	2	731
<i>The South:</i>					
Virginia	24	7	826	7	850
Kentucky	5	2	385	2	386
Alabama	46	18	4,855	18	4,670
Tennessee	20	4	534	5	605
Total	423	211	71,095	229	76,111

Among the furnaces which became idle in April were one Bethlehem, Carbon which was banked and one Lock Ridge in the Lehigh Valley; one Shoenberger, one Carrie, two Duquesne, one Edgar Thomson and one Monongahela (National Tube Company) in the Pittsburgh district; Fannie, one Farrell, Hall and one Shenango which is out for relining in the Shenango Valley; one Mingo and two National Tube Company stacks (Riverside and Benwood) in the Wheeling district, one Ohio in the Mahoning Valley; Emma, No. 5 Lorain furnace of the National Tube Company and one Toledo in northern Ohio; Woodward No. 2 in Alabama and Johnson City in Tennessee.

The list of furnaces blown in last month includes Northern in New York which had been banked, No. 1 Cleveland in northern Ohio and Hattie Ensley and No. 4 Bessemer in Alabama.

## DIAGRAM OF PIG-IRON PRODUCTION AND PRICES

The fluctuations in pig-iron production from January, 1907, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of *The Iron Age*. The figures for daily average production are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907—  
Gross Tons

1907	1908	1909	1910	1911	1912	1913	1914
71,149	33,918	57,975	84,148	56,752	66,384	90,172	66,808
75,038	37,163	60,976	85,616	64,090	72,442	92,369	67,453
71,821	39,619	59,232	84,459	70,036	77,591	89,147	75,738
73,885	38,289	57,962	82,792	68,836	79,181	91,759	75,665
74,048	37,603	60,753	77,102	61,079	81,051	91,039	75,665
74,186	36,444	64,656	75,516	59,585	81,358	87,619	75,665
July	72,763	39,287	67,793	69,305	57,841	77,738	82,601
Aug.	72,594	42,851	72,546	67,963	62,150	81,046	82,057
Sept.	72,783	47,300	79,507	68,476	65,903	82,128	83,531
Oct.	75,386	50,554	83,856	67,520	67,811	86,722	82,133
Nov.	60,337	51,595	84,917	63,659	66,648	87,697	74,453
Dec.	59,815	56,158	85,022	57,349	65,912	89,766	63,987

## THE RECORD OF PRODUCTION

Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1910—Gross Tons

1910	1911	1912	1913	1914
2,608,605	2,749,326	2,057,911	2,795,331	1,885,054
2,397,254	1,794,509	2,100,815	2,586,337	1,888,670
2,617,949	2,171,111	2,405,318	2,763,563	2,347,867
2,483,763	2,064,086	2,375,436	2,752,761	2,269,217
2,390,180	1,893,456	2,512,582	2,822,217	2,269,217
2,285,478	1,787,566	2,440,745	2,628,565	2,269,217
2,148,442	1,793,063	2,410,839	2,560,646	2,269,217
2,106,847	1,926,637	2,512,431	2,545,763	2,269,217
2,056,275	1,997,102	2,463,839	2,505,927	2,269,217
2,093,121	2,102,147	2,689,933	2,546,261	2,269,217
1,909,180	1,999,433	2,630,854	2,233,123	2,269,217
1,777,317	2,043,270	2,782,737	1,983,607	2,269,217

## Mechanical Engineers' Spring Meeting

Among the papers and addresses announced for the so-called spring meeting of the American Society of Mechanical Engineers, to be held this year at St. Paul and Minneapolis, June 16 to 19, are the following:

"Industrial Service Work in Engineering Schools," by Prof. J. W. Roe, Yale University.

"Classification and Heating Value of American Coal," by Prof. William Kent.

"The Railroad Track Scale," by W. W. Boyd, Baltimore.

"Gear Testing Machine," by Wilfred Lewis, president Tabor Mfg. Company, Philadelphia.

"A New Flow Metering Appliance," by A. M. Levin, Chicago.

"Iron Ore Handling," with motion pictures, by John Hearding, superintendent Oliver Iron Mining Company, Duluth.

A message to the engineering fraternity by James J. Hill, former president of the Great Northern System.

A session on powdered fuel is announced but the list of authors is not yet forthcoming.

It has been arranged to have a special train convey the members from Chicago to St. Paul, over the Burlington, leaving Chicago Monday evening, June 15, at 10:45, and arriving in St. Paul at 3:30 on Tuesday afternoon. The train will be electric lighted from the head end by a 64-volt, 25-kw. Curtis turbo-generator. A dynamometer car in full operation will be attached to the train, showing how the various tests records on railroads are taken automatically. A stop en route will be made at De Soto, Wis., on Tuesday morning for the observation of tracking work being accomplished by a dredging process never before used. At Grand Crossing, Wis., another stop will be made to view a large non-articulated locomotive.

## Blast Furnace Notes

The Cleveland Furnace Company, Cleveland, Ohio, is at present operating both its blast furnaces, having blown in the No. 1 stack early in April, preparatory to blowing out its No. 2 furnace for relining. The latter will probably go out of blast some time this month.

The Midland furnace of the Pittsburgh Crucible Steel Company, Midland, Pa., has been blown out for relining. This furnace was in blast for nine years on one lining, probably a record performance in this respect.

Corrigan, McKinney & Co., Cleveland, Ohio, blew in their Genesee furnace at Charlotte, N. Y., May 6.

Hall furnace of the Republic Iron & Steel Company at Sharon, Pa., was blown out last week, the company not requiring the output of this furnace at present.

No. 1 blast furnace of the Carnegie Steel Company at Farrell, Pa., was blown out on Thursday, April 30.

The Bethlehem Steel Company now has four blast furnaces in operation, Furnace E having been blown out on April 29.

In the Pittsburgh district six furnaces were blown out in April: one Shoenberger, one Carrie, two Duquesne, one Edgar Thomson and one Monongahela.

Mattie furnace of the Girard Iron Company, Girard, Ohio, will be blown in this week.

The Western Malleables Company, incorporated with a capital stock of \$400,000, will own and operate the various works of the defunct Beaver Dam Malleable Iron Company at Beaver Dam, Wis. Louis N. Biron, Emmet Horan, Jr., and August C. Moeller, Milwaukee attorneys, appear as corporators. The organization will be effected and officers and directors elected this week, and it is intended to resume full operation of the works at once. These works, comprising four plants, have a combined annual capacity of over 30,000 tons and produce tie plates and other railroad malleable castings.

# The Iron and Metal Markets

## LOWER LAKE ORE PRICES

### Going Back to the Basis of 1912

#### Pig Iron Output Declining—Low Priced Basic Sales at Chicago

Scarcely a ripple has been caused by the news that Lake Superior iron ore had been quoted on Saturday for 1914 delivery on the basis of the prices of 1912. This is a reduction of 65 cents on Bessemer ore, 50 cents on old-range non-Bessemer and 55 cents on Mesaba range non-Bessemer from the prices of last year, making old-range and Mesaba Bessemer \$3.75 and \$3.50 respectively and old-range and Mesaba non-Bessemer \$3 and \$2.85.

Some reservations of ore for 1914 became contracts on the naming of the new prices, but there is practically no inquiry, as the piles of 1913 ore at blast furnace yards are huge and in many cases will last well into the fall. Pig iron prices have anticipated the ore reduction by several months.

Pig iron production in April was 2,269,955 tons against 2,347,867 tons in March, the daily rate figuring out 75,665 tons and 75,738 tons respectively. The expected curtailment did not come in April, but the blowing out of furnaces came thick toward the close of the month. Thus the figures of active capacity May 1 are the real index to what is going on. With a net loss of 18 furnaces in April (211 being in blast May 1 against 229) the capacity active at the beginning of this month was 71,095 tons a day, over 5000 tons less than on April 1, when it was 76,111 tons.

Steel works furnaces did most of the blowing out, and several more are to stop this month. Stocks of pig iron at both steel works and merchant furnaces, with a few exceptions, increased in April.

Here and there is a trace of betterment in the market reports of the week, but their general tone is unchanged. Steel production for the country is probably 60 to 65 per cent. of capacity, though in some lines, as plates and sheets, part of the mills are on a 50 per cent. basis. Pittsburgh finds no sign that demand will be better in the near future except in the backing up of business and the fact that consumers' stocks are again being drawn down in the way that was seen in November and December.

A few crumbs have fallen to the rail manufacturers. The Erie has placed 12,000 tons with the Carnegie Steel Company and 2000 tons with the Illinois Steel Company, which also has a 2000-ton order from the St. Paul. The Pennsylvania Steel Company has taken 1800 tons of girder rails in the Middle West, and at St. Louis interurban roads have inquired for 3000 tons of T rails. The Seaboard Air Line is expected to buy rails soon.

Low structural prices commonly induce speculative building, but there is little of this today, most cities being overbuilt. In the East about 20,000 tons of steel is represented in active projects. Two Eastern contracts recently closed were on a 1.10c. basis for shapes; on the other hand, 1.15c. at Pitts-

burgh is the lowest price some fabricators have found. The telephone building at Pittsburgh, 3500 tons, and the addition of the American Brass Company at Torrington, Conn., 3000 tons, were taken by the American Bridge Company.

Prices of steel bars have weakened to the extent that while a good many sales have been made in recent weeks at 1.20c. Pittsburgh, particularly in the East, 1.15c. now applies generally. Some of the bar iron mills have but two or three weeks' business ahead.

The National Tube Company has announced a reduction of \$2 a ton on boiler tubes and \$1 a ton on 2-in. line pipe. Some of the pipe mills are now running to but 60 per cent. of capacity.

Wire mills are not all holding to the \$1.40 basis for fence wire, competition being more active in the Middle West.

A 10,000-ton sale of basic iron in the St. Louis district has attracted attention, the delivered price representing close to \$13 at Chicago district furnace, or 50 cents less than the last considerable basic sale in that district. A 5000-ton lot, also for St. Louis territory, went to a Chicago steel company's furnaces. In northern Ohio a 15,000-ton basic inquiry has come out for the third quarter.

### A Comparison of Prices

#### Advances Over the Previous Week in Heavy Type, Declines in Italics

	May 6, April 29, April 1, May 7,			
<b>Pig Iron,</b> Per Gross Ton :	1914.	1914.	1914.	1913.
No. 2, X, Philadelphia...	\$15.00	\$15.00	\$15.00	\$17.00
No. 2, Valley furnace...	13.00	13.00	13.25	15.00
No. 2, Southern, Cin'ti...	13.75	13.75	13.75	15.25
No. 2, Birmingham, Ala...	10.50	10.50	10.50	12.00
No. 2, furnace, Chicago*	14.25	14.25	14.25	16.00
Basic, del'd, eastern Pa...	14.25	14.25	14.25	16.50
Basic, Valley furnace...	13.00	13.00	13.00	15.50
Bessemer, Pittsburgh...	14.90	14.90	14.90	17.30
Malleable Bess., Ch'go*	14.25	14.25	14.25	16.00
Gray forge, Pittsburgh...	13.65	13.65	13.65	15.40
L. S. charcoal, Chicago...	15.75	15.75	15.25	18.00

	Billets, etc., Per Gross Ton :			
Bess. billets, Pittsburgh...	20.00	20.00	21.00	28.00
O.-h. billets, Pittsburgh...	20.00	20.00	21.00	28.50
O.-h. sheet bars, P'gh...	21.00	21.00	22.00	29.50
Forging billets, base, P'gh...	25.00	25.00	25.00	36.00
O.-h. billets, Phila.....	22.40	22.40	23.40	29.00
Wire rods, Pittsburgh...	26.00	26.00	26.00	30.00

	Old Material, Per Gross Ton :			
Iron rails, Chicago.....	12.75	12.75	12.75	16.00
Iron rails, Philadelphia...	15.50	15.50	16.50	18.00
Carwheels, Chicago.....	11.50	11.50	11.75	15.25
Carwheels, Philadelphia...	11.75	12.00	12.00	14.00
Heavy steel scrap, P'gh...	11.50	11.50	12.00	13.75
Heavy steel scrap, Phila...	10.50	10.75	11.00	12.50
Heavy steel scrap, Ch'go	10.00	10.25	9.75	11.75
No. 1 cast, Pittsburgh...	11.50	11.50	11.50	13.75
No. 1 cast, Philadelphia...	12.50	13.00	13.00	13.75
No. 1 cast, Ch'go (net ton)	10.25	10.25	10.25	11.75

	Finished Iron and Steel,			
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia...	1.20	1.20	1.22 $\frac{1}{2}$	1.37 $\frac{1}{2}$
Iron bars, Pittsburgh...	1.30	1.30	1.35	1.70
Iron bars, Chicago.....	1.10	1.10	1.17 $\frac{1}{2}$	1.37 $\frac{1}{2}$
Steel bars, Pittsburgh...	1.15	1.15	1.15	1.70
Steel bars, New York...	1.31	1.31	1.31	1.86
Tank plates, Pittsburgh...	1.15	1.15	1.15	1.60
Tank plates, New York...	1.31	1.31	1.31	1.78
Beams, etc., Pittsburgh...	1.15	1.15	1.15	1.50
Beams, etc., New York...	1.31	1.31	1.31	1.66
Skelp, grooved steel, P'gh	1.20	1.20	1.20	1.45
Skelp, sheared steel, P'gh	1.25	1.25	1.25	1.50
Steel hoops, Pittsburgh...	1.25	1.25	1.25	1.60

	Sheets, Nails and Wire,			
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh	1.85	1.90	1.95	2.30
Galv. sheets, No. 28, P'gh	2.85	2.85	2.95	3.40
Wire nails, Pittsburgh...	1.60	1.60	1.60	1.80
Cut nails, Pittsburgh...	1.65	1.65	1.65	1.70
Fence wire, base, P'gh...	1.40	1.40	1.40	1.60
Barb wire, galv., P'gh...	2.00	2.00	2.00	2.20

\*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

## Coke, Connellsburg,

	May 6, April 29	April 1, May 7,	
Per Net Ton at Oven:	1914.	1914.	1913.
Furnace coke, prompt...	\$1.85	\$1.85	\$2.15
Furnace coke, future...	2.00	2.00	2.25
Foundry coke, prompt...	2.40	2.40	3.00
Foundry coke, future...	2.50	2.50	2.90

## Metals.

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York.	14.50	14.50	14.87 1/2	16.00
Electrolytic copper, N. Y.	14.20	14.12 1/2	14.37 1/2	15.62 1/2
Spelter, St. Louis.	4.85	4.85	5.12 1/2	5.40
Spelter, New York.	5.00	5.00	5.27 1/2	5.55
Lead, St. Louis.	3.80	3.80	3.70	4.20
Lead, New York.	3.90	3.90	3.80	4.35
Tin, New York.	33.00	34.60	37.90	50.12 1/2
Antimony, Hallett's, N. Y.	6.75	6.75	6.75	8.12 1/2
Tin plate, 100-lb. box, P'gh	\$3.30	\$3.30	\$3.30	\$3.60

## Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh, in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22 1/2c.; Kansas City, 42 1/2c.; Omaha, 42 1/2c.; St. Paul, 32c.; Denver, 84 1/2c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, 1/4 in. thick, 6 1/4 in. up to 100 in. wide, 1.15c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers with extras:

Rectangular plates, tank steel or conforming to manufacturer's standard specifications for structural steel dated February 6, 1903, or equivalent, 1/4 in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered 1/4-in. plates. Plates over 72 in. wide must be ordered 3/4 in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gauges under 1/4 in. to and including 3-16 in....	10
Gauges under 3-16 in. to and including No. 8.....	15
Gauges under No. 8 to and including No. 9.....	25
Gauges under No. 9 to and including No. 10.....	30
Gauges under No. 10 to and including No. 12.....	40
Sketches (including straight taper plates), 3 ft. and over	10
Complete circles 3 ft. in diameter and over.....	20
Boiler and flange steel.....	10
"A. B. M. A." and ordinary firebox steel.....	20
Still bottom steel.....	30
Marine steel.....	40
Locomotive firebox steel.....	50
Widths over 100 in. up to 110 in., inclusive.....	05
Widths over 110 in. up to 115 in., inclusive.....	10
Widths over 115 in. up to 120 in., inclusive.....	15
Widths over 120 in. up to 125 in., inclusive.....	25
Widths over 125 in. up to 130 in., inclusive.....	50
Widths over 130 in.....	1.00
Cutting to lengths, under 3 ft., to 2 ft. inclusive.....	25
Cutting to lengths, under 2 ft., to 1 ft. inclusive.....	50
Cutting to lengths, under 1 ft.....	1.55
No charge for cutting rectangular plates to lengths 3 ft. and over.	

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, 1/4 in. thick and over, and zees, 3 in. and over, 1.15c. Extras on other shapes and sizes are as follows:

Cents per lb.
I-beams over 15 in.....
H-beams over 18 in.....
Angles over 6 in. on one or both legs.....
Angles, 3 in. on one or both legs, less than 1/4 in. thick, as per steel bar card, Sept. 1, 1909.....
Tees, structural sizes (except elevator, hand rail, car truck and conductor rail).....
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909.....
Deck beams and bulb angles.....
Hand rail tees.....
Cutting to lengths, under 3 ft. to 2 ft. inclusive.....
Cutting to lengths, under 2 ft. to 1 ft. inclusive.....
Cutting to lengths, under 1 ft.....
No charge for cutting to lengths 3 ft. and over.

Wire Products.—Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, \$1.40; galvanized, \$1.80. Galvanized barb wire and fence staples to jobbers, \$2; painted, \$1.60. Wire nails to jobbers, \$1.60. Prices of the foregoing wire products to dealers in carload lots are 5c. higher. Woven wire fencing, 73 1/2 per cent. off list for carloads; 72 1/2 off for 1000-rod lots; 71 1/2 off for less than 1000-rod lots.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.										
Nos. 0 to 9	10	11	12 & 12 1/2	13	14	15	16			
Annealed	\$1.60	\$1.65	\$1.70	\$1.75	\$1.85	\$1.95	\$2.05	\$2.15		
Galvanized	2.05	2.05	2.10	2.15	2.25	2.35	2.75	2.85		

Wire Rods.—Bessemer, open-hearth and chain rods, \$26.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe in effect from April 20, 1914, and iron pipe from June 2, 1913, all full weight:

Butt Weld				Iron			
Inches	Black Galv.	Inches	Black Galv.				
1/8, 1/4 and 3/8	73	52 1/2	1/8 and 3/4	66	47		
1/2	77	66 1/2	1/2	65	46		
5/8 to 3	80	71 1/2	5/8 to 2 1/2	69	56		
			7/8 to 2 1/2	72	61		

Lap Weld			
2	77	68 1/2	1 1/2
2 1/2 to 6	79	70 1/2	2
7 to 12	76	65 1/2	2 1/2 to 4
13 to 15	53	..	4 1/2 to 6
			7 to 12

Reamed and Drifted			
1 to 3, butt	78	69 1/2	1 to 1 1/2, butt
2, lap	75	66 1/2	2, butt
2 1/2 to 6, lap	77	68 1/2	1 1/2, lap
			2, lap
			2 1/2 to 4, lap

Butt Weld, extra strong, plain ends			
1/8, 1/4 and 3/8	68	57 1/2	3/8
1/2	73	66 1/2	1/2
3/4 to 1 1/2	77	70 1/2	3/4 to 1 1/2
2 to 3	78	71 1/2	2 and 2 1/2

Lap Weld, extra strong, plain ends			
2	74	65 1/2	1 1/2
2 1/2 to 4	76	67 1/2	2
4 1/2 to 6	75	66 1/2	2 1/2 to 4
7 to 8	68	57 1/2	4 1/2 to 6
9 to 12	63	52 1/2	7 and 8
			9 to 12

Butt Weld, double extra strong, plain ends			
1/8	63	56 1/2	1/2
3/4 to 1 1/2	66	59 1/2	3/4 to 1 1/2
2 to 2 1/2	68	61 1/2	2 and 2 1/2
			62

Lap Weld, double extra strong, plain ends			
2	64	57 1/2	2
2 1/2 to 4	66	59 1/2	2 1/2 to 4
4 1/2 to 6	65	58 1/2	4 1/2 to 6
7 to 8	58	47 1/2	7 to 8

To the large jobbing trade an additional 5 and 2 1/2 per cent. is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts to jobbers, in carloads, in effect from May 1, 1914, are as follows:

Lap Welded Steel		Standard Charcoal Iron	
1 1/2 and 2 in.	2 1/2 in.	1 1/2 in.	2 in.
2 1/4 in.	59	1 1/2 and 2 in.	49
2 1/2 and 2 1/2 in.	65	2 1/4 in.	45
3 and 3 1/4 in.	70	2 1/2 to 2 1/2 in.	54
3 1/2 to 4 1/2 in.	72	3 and 3 1/4 in.	57
5 and 6 in.	65	3 1/2 to 4 1/2 in.	60
7 to 13 in.	62	5 and 6 in.	49

Locomotive and steamship special charcoal grades bring higher prices.

2 1/2 in. and smaller, over 18 ft., 10 per cent. net extra.

2 1/2 in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft., and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets		Cents per lb.
Nos. 3 to 8		1.35
Nos. 9 to 16		1.40
Nos. 11 and 12		1.45
Nos. 13 and 14		1.50
Nos. 15 and 16		1.60

Box Annealed Sheets, Cold Rolled	
Nos. 10 and 11	Nos. 12
1.50 to 1.55	1.50 to 1.55
1.55 to 1.60	1.55 to 1.60
1.60 to 1.65	1.60 to 1.70
1.65 to 1.70	1.70 to 1.75
1.70 to 1.75	1.75 to 1.80
1.75 to 1.80	1.80 to 1.85
1.80 to 1.85	1.85 to 1.90
1.85 to 1.90	1.90 to 1.95
1.90 to 1.95	2.00 to 2.05

Galvanized Sheets of Black Sheet Gauge	
	Cents per lb.
Nos. 10 and 11	1.85 to 1.90
No. 12	1.95 to 2.00
Nos. 13 and 14	1.95 to 2.00
Nos. 15 and 16	2.10 to 2.15
Nos. 17 to 21	2.25 to 2.30
Nos. 22 and 24	2.40 to 2.45
Nos. 25 and 26	2.55 to 2.60
No. 27	2.70 to 2.75
No. 28	2.85 to 2.90
No. 29	3.00 to 3.05
No. 30	3.15 to 3.20

## Pittsburgh

PITTSBURGH, PA., May 5, 1914.

The local steel trade is in about as bad condition as it is possible for it to get, and there is no sign of betterment in the near future. The tendency of prices is still downward. The National Tube Company has reduced steel boiler tubes \$2 a ton and casing and 2-in. line pipe \$1 per ton. Very little new business is coming out. The matter of reducing wages still has the attention of the heads of leading steel companies.

**Pig Iron.**—W. P. Snyder & Co. report the average price of basic iron in April to have been \$13 and Bessemer \$14 at Valley furnace, a reduction from the March price of basic of about 4c. per ton and of Bessemer about 16c. a ton. The local market is still bare of new inquiries, and only carload lots are being sold. In the almost entire absence of sales, we repeat former prices: Bessemer, \$14; basic, \$13; No. 2 foundry, \$13 to \$13.50; gray forge, \$12.75 to \$13; malleable Bessemer, \$13.25, for delivery through first half of this year, all at Valley furnace, the freight rate to the Pittsburgh or Cleveland district being 90c. a ton.

**Billets and Sheet Bars.**—No new sales are being made, as consumers are covered for some time ahead. Several large tin-plate makers, who get their tin bars based on the price of tin plate, are getting bars at less than \$21, Pittsburgh, which is regarded as the present price. We quote Bessemer and open-hearth billets at \$20, and Bessemer and open-hearth sheet bars at \$21, f.o.b., makers' mills, Pittsburgh or Youngstown, for May and June delivery; forging billets, \$25 on desirable specifications, embracing only one size, and up to but not including 10 x 10 in., the regular extras being charged for larger sizes. On small orders forging billets are held at \$26. We quote axle billets at \$23 for desirable orders and \$24 for small orders.

**Muck Bar.**—We do not hear of any new sales and quote best grades, made from all pig iron, at about \$27, delivered to buyers' mills in the Pittsburgh district.

**Steel Rails.**—Orders for standard sections are very scarce, and only small lots are being placed. The new demand for light rails is fair, the Carnegie Steel Company having received new orders and specifications within the past week for about 2100 tons. We quote splice bars at 1.50c.; standard section Bessemer rails, 1.25c.; open-hearth standard sections, 1.34c., f.o.b. Pittsburgh. We quote light rails rolled from billets as follows: 25, 30, 35, 40 and 45 lb. sections, 1.10c.; 16 and 20 lb., 1.15c.; 12 and 14 lb., 1.20c., and 8 and 10 lb., 1.25c., in carload lots, f.o.b. Pittsburgh. For large lots, these prices might be slightly shaded.

**Plates.**—No important orders for steel cars have been placed recently, and there is a dearth of inquiry from the railroads. The new demand for plates is dull, and none of the plate mills is able to run to over 50 per cent. of capacity. We quote  $\frac{1}{4}$ -in. and heavier plates at 1.15c., f.o.b. Pittsburgh, but it is stated that on some recent business this price has been shaded \$1 a ton.

**Structural Material.**—There is a fair amount of inquiry, but new work is very slow in coming out. The McClintic-Marshall Company has taken 1350 tons for a highway bridge over the Muskingum River at Zanesville, Ohio, and the American Bridge Company has taken 3500 tons for a telephone building in this city and 1500 tons for a bridge across the Kanawha River at Charleston, W. Va. We quote beams and channels up to 15-in. at 1.15c., f.o.b. Pittsburgh, but it is possible that on a very desirable order this might be shaded.

**Ferroalloys.**—The local market is lifeless. The fact

that steel works are operating to only 50 to 60 per cent. has made a large decrease in the consumption of ferro-alloys, and consumers are not taking out material promptly on their contracts. English 80 per cent. ferromanganese is still held at \$39, Baltimore, but this price is nominal and would be shaded probably \$1 a ton if any new business was in the market. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at \$73; over 100 tons to 600 tons, \$72; over 600 tons, \$71, delivered in the Pittsburgh district. We quote 10 per cent. ferrosilicon at \$19.50; 11 per cent., \$20.50, and 12 per cent., \$21.50, f.o.b. cars Jackson County, Ohio, or Ashland, Ky., furnace. We quote 20 per cent. spiegeleisen at \$25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over, and 12 $\frac{1}{2}$ c. in less than 2000-lb. lots.

**Wire Rods.**—In sympathy with the dull business in the wire trade, the new demand for rods is light and prices are weak. The nominal price of Bessemer, open-hearth and chain rods is \$26, Pittsburgh, for small lots, but \$25.50 or less could be done if any large business was offering.

**Skelp.**—There is very little new demand and all the mills are running short of work. A sale of 1000 tons of narrow grooved steel skelp is reported at a shade under 1.20c., delivered in Pittsburgh. We quote: Grooved steel skelp, 1.20c. to 1.25c.; sheared steel skelp, 1.25c. to 1.30c.; grooved iron skelp, 1.60c. to 1.65c., and sheared iron skelp, 1.65c. to 1.70c., delivered to consumers' mills in the Pittsburgh district.

**Sheets.**—The new demand for black and galvanized sheets does not show any improvement. Some of the larger sheet mills are not running to over 50 per cent., while others are doing a little better. There has been a large increase in sheet capacity the past year and some of the newer mills are going after orders aggressively. The market on No. 28 galvanized sheets is 2.85c. to 2.90c., but in some cases 2.80c. is being done. We quote Nos. 9 and 10 blue annealed sheets at 1.40c.; No. 28 Bessemer black sheets, 1.85c. to 1.90c.; No. 28 galvanized, 2.85c. to 2.90c.; No. 28 tin mill black plate, H. R. and A., 1.90c.; Nos. 29 and 30, 1.95c. These prices are f.o.b., Pittsburgh, in carload lots, jobbers charging the usual advances for small lots from store.

**Tin Plate.**—Specifications against contracts continue very heavy, and leading mills are all operating to practically 100 per cent. The tin-plate trade is the most active in specifications in the entire list of finished material. Only small orders are being placed at present, as consumers have covered for months ahead, and on these prices 100-lb. cokes are \$3.30 to \$3.40 and 100-lb. ternes \$3.20 to \$3.30 per base box, f.o.b. Pittsburgh.

**Wire Products.**—The wire trade is very quiet, and specifications from jobbers on contracts placed some time ago, when prices were lower than now, are not coming in very freely. The prices of \$1.60 on wire nails and \$1.40 on plain annealed wire are still in force, but these are not always strictly observed and are still being shaded at Ohio River points to meet the competition of mills that have low rates of freight. We quote: Wire nails, \$1.60; plain annealed wire, \$1.40; galvanized barb wire and fence staples, \$2; painted barb wire, \$1.60, all per 100 lb., f.o.b. Pittsburgh, with actual freight charge to point of delivery, terms being 30 days net less 2 per cent. off for cash in ten days. We quote cut nails at \$1.65, f.o.b. Pittsburgh. Discounts on woven wire fencing are 78 $\frac{1}{2}$  per cent. off in carload lots, 72 $\frac{1}{2}$  per cent. off on 1000-rod lots and 71 $\frac{1}{2}$  per cent. on less than 1000-rod lots, all f.o.b. Pittsburgh.

**Iron and Steel Bars.**—The new demand for both iron and steel bars is dull, and mills report that specifications against contracts are much lighter than usual at this season. Specifications for steel bars so far from the implement trade have been very unsatisfactory and show no signs of getting better. Prices are only fairly strong. We quote steel bars at 1.15c. to 1.20c. and common iron bars at 1.30c. to 1.35c., f.o.b. makers' mills, Pittsburgh. Regular extras for twisting reinforcing steel bars over the base price are as follows:  $\frac{1}{4}$ -in. and over, \$1;  $\frac{1}{2}$  to 11/16 in., \$1.50; under  $\frac{1}{2}$  in., \$2.50 per net ton. These extras are not always observed, and

ills that roll steel bars from old rails sometimes entirely omit them.

**Rivets, Nuts and Bolts.**—Only a light demand for nuts and bolts is reported, and being merely for such quantities as are needed for current wants. The new demand for rivets is dull, as the boiler shops are running very light. Prices on nuts, bolts and rivets are somewhat shaded. We quote button-head structural rivets at 1.60c. to 1.65c. and cone-head boiler rivets at 1.70c. to 1.75c., in carload lots, an advance of about \$2 a ton over these prices being charged for small lots. Terms 30 days net, less 2 per cent. for cash in 10 days. Discounts on nuts and bolts are as follows in lots of 300 lb. or over, delivered within a 20c. freight radius of makers' works:

Coach and lag screws	80 and 5% off
Small carriage bolts, cut threads	80% off
Small carriage bolts, rolled threads	80 and 5% off
Large carriage bolts	75 and 5% off
Small machine bolts, cut threads	80 and 5% off
Small machine bolts, rolled threads	80 and 10% off
Large machine bolts	75 and 10% off
Machine bolts, c.p.c. & t nuts, small	80% off
Machine bolts, c.p.c. & t nuts, large	75 and 5% off
Square h.p. nuts, blanked and tapped	\$6.30 off list
Hexagon nuts	\$7.20 off list
C.p.c. and r sq. nuts, blanked and tapped	\$6.00 off list
Hexagon nuts, 5/8 and larger	\$7.20 off list
Hexagon nuts, smaller than 5/8 in.	\$7.80 off list
C.P. plain square nuts	\$5.50 off list
C.P. plain hexagon nuts	\$5.90 off list
Semi-fin. hex. nuts, smaller than 5/8 in.	85 and 5% off
Semi-fin. hex. nuts, smaller than 9/16, 85, 10 & 10% off	
Rivets, 7/16 x 6 1/2, smaller & shorter	80, 10 & 5% off
Rivets, metallic tinned, bulk	80, 10 and 10% off
Rivets, tin plated, bulk	80, 10 and 10% off
Rivets, metallic tinned, packages	80, 10 and 5% off
Standard cap screws	70, 10 and 10% off
Standard set screws	75, 10 and 10% off

**Hoops and Bands.**—There is very little new buying and only in small lots, as consumers are covered to July or longer. Specifications against contracts are only fair. We quote steel bands at 1.15c., with extras on per steel-bar card, and steel hoops at 1.25c., f.o.b. Pittsburgh.

**Shafting.**—It is stated that the new demand and specifications against contracts do not represent more than 35 per cent. of capacity. Specifications from implement makers are quiet, but from three or four of the leading automobile builders are fairly active. One leading maker of automobiles is reported to be taking about 20 per cent. more shafting this year than last year. We quote cold-rolled shafting at 64 to 65 per cent. off on large lots and 62 to 63 per cent. off in small lots, delivered in base territory.

**Merchant Steel.**—Mills report specifications unsatisfactory, but the new demand for seasonable steels is reported to be slightly better. Prices are not strong, and on small lots are about as follows: Iron finished tire, 1/2 x 1 1/2 in. and larger, 1.30c., base; under 1/2 x 1 1/2 in., 1.45c.; planished tire, 1.50c.; channel tire, 5/8 to 7/8 and 1 in., 1.80c. to 1.90c.; 1 1/2 in. and larger, 1.90c.; toe calk, 1.90c. to 2c., base; flat sleigh shoe, 1.65c.; concave and convex, 1.70c.; cutter shoe, tapered or bent, 2.20c. to 2.30c.; spring steel, 1.90c. to 2c.; machinery steel, smooth finish, 1.70c. We quote cold-rolled strip steel as follows: Base rates for 1 in. and 1 1/2 in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.25c.; soft, 3.50c.; coils, hard, 3.15c.; soft, 3.40c.; freight allowed. The usual differentials apply for lighter sizes.

**Spikes.**—No new inquiries are in the market from railroads, and they are not specifying very freely on contracts they placed earlier in the year. None of the spike makers is running to full capacity and the outlook for this trade is not encouraging. We quote standard sizes of railroad spikes at \$1.40 to \$1.45 and small railroad and boat spikes at \$1.50 to \$1.55 per 100 lb., f.o.b. Pittsburgh.

**Standard Pipe.**—The new demand for merchant pipe is only fair, and as a rule pipe mills are not running to over about 60 per cent. of their capacity. The National Tube Company and other pipe mills have sent out new discount cards showing a reduction of \$1 a ton in prices of casing and 2-in. line pipe. No changes have been made in other oil-country goods, tubing and drive-line pipe. A material betterment in the new demand for merchant pipe, also for larger sizes of line pipe for oil and gas lines, is looked for in the near future. The present discounts on merchant steel pipe, adopted April 20, are being firmly held.

**Boiler Tubes.**—Effective May 1 the National Tube Company and other makers of steel boiler tubes sent out a new card increasing the discounts one point, equal to a reduction of \$2 a ton. For some time prices of merchant and locomotive tubes have been more or less shaded. The new demand is quiet and none of the mills has enough business to run to more than 50 per cent. of capacity.

**Old Material.**—The market is still very dull, the only material moving from dealers to consumers being on contracts placed some time ago. While prices are low, consumers do not believe bottom has been reached, and they are not yet willing to buy ahead, believing that unless general business conditions improve prices may go still lower. A sale of 400 tons of selected heavy steel scrap is reported at about \$12.10, delivered to consumer's mill. Dealers quote, per gross ton, for delivery to consumers' mills in the Pittsburgh and nearby districts that take the same rates of freight as follows:

Selected heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	\$12.00 to \$12.25
Ordinary steel melting scrap	11.50 to 11.75
Compressed side and end sheet scrap	10.50 to 10.75
No. 1 foundry cast	11.50 to 11.75
No. 2 foundry cast	10.25 to 10.50
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	8.75 to 9.00
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	12.75 to 13.00
No. 1 railroad malleable stock	11.00 to 11.25
Railroad grate bars	10.25 to 10.50
Low phosphorus melting stock	14.50 to 14.75
Iron car axles	22.50 to 23.00
Steel car axles	15.50 to 16.00
Locomotive axles, steel	20.00 to 20.50
No. 1 busheling scrap	10.25 to 10.50
No. 2 busheling scrap	7.25 to 7.50
Machine shop turnings	7.50 to 7.75
Old carwheels	11.25 to 11.50
Cast-iron borings	7.50 to 7.75
Sheet bar crop ends	12.00 to 12.25
Old iron rails	13.75 to 14.00
No. 1 railroad wrought scrap	11.50 to 11.75
Heavy steel axle turnings	8.50 to 8.75
Heavy breakable cast scrap	12.00 to 12.25

†Shipping point.

**Coke.**—This trade is still very quiet. One leading consumer that bought heavily of furnace coke for April shipment at \$2 per ton is not willing to buy for the entire month of May, but will probably take in a fair amount at \$2 unless in the meantime it should blow out its blast furnaces. There is no spot coke selling and the output is still being reduced. We quote standard makes of blast furnace coke for spot shipment at \$1.85 to \$1.90 per net ton at oven. Several of the leading makers of standard furnace coke are holding it at \$2 a ton on contracts. We quote standard 72-hr. foundry coke at \$2.40 to \$2.50 per net ton at oven to consumers. The Connellsville Courier reports the output of the upper and lower Connellsville regions for the week ending April 25 as 313,757 net tons, a decrease over the previous week of 20,898 tons.

## Chicago

CHICAGO, ILL., May 6, 1914.—(By Wire.)

Business placed with the mills during the week affords more occasion for cheerfulness. But a general survey of the market shows no particular improvement and some reports indicate a tendency toward an even more reduced volume of orders. Specifications for about 12,000 tons of standard rails, about 3000 tons of traction rails and a number of orders and specifications for shapes and plates, to apply against contracts for fabricated steel recently taken by bridge shops, rounded out a very acceptable aggregate. In other respects, producers are still in the dumps, very hungry for business and much in the dark as to the prospect for better conditions. In addition to a total of about 4750 tons of miscellaneous contracts for fabricated steel placed, it is understood that the American Bridge Company is the successful bidder for about 2500 tons for the Lake street bridge at Chicago. In the pig-iron market interest centers about the purchase of 15,000 tons of Northern basic iron by a St. Louis consumer. The scrap market has relapsed again following a very brief rally.

**Pig Iron.**—The only transaction in this market of any importance was the purchase of 15,000 tons of Northern basic iron by the Commonwealth Steel Company. One of the Chicago merchant stacks will make 10,000 tons and the remaining 5000 tons will come from one of the steel companies in the Chicago district. The transaction is of particular interest, following so closely after the reports of losses sustained by pig-iron makers since January 1, for the reason that the price made was even lower than at the time of this company's last purchase when \$13.50 at Chicago furnace was done. Deliveries are to extend through the last half. Other activity in the market is confined to scattering sales of small importance. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal	\$15.75 to \$16.75
Northern coke foundry, No. 1	14.75 to 15.00
Northern coke foundry, No. 2	14.25 to 14.75
Northern coke foundry, No. 3	14.00 to 14.25
Southern coke, No. 1 dry and 1 soft	15.35 to 15.85
Southern coke, No. 2 dry and 2 soft	14.85 to 15.35
Southern coke, No. 3	14.35 to 14.85
Southern coke, No. 4	13.85 to 14.35
Southern gray forge	13.35 to 13.85
Southern mottled	13.10 to 13.35
Malleable Bessemer	14.25 to 14.50
Standard Bessemer	17.00
Basic	13.25 to 13.75
Jackson Co. and Ky. silvery, 6 per cent.	16.90 to 17.40
Jackson Co. and Ky. silvery, 8 per cent.	17.90 to 18.40
Jackson Co. and Ky. sil'vy, 10 per cent.	18.90 to 19.40

(By Mail)

**Rails and Track Supplies.**—The leading interest has received a release of 7000 tons of rails for a Western trunk line and has other specifications for three lots of 2000, 2000 and 1200 tons. A better specifying against spikes and bolt contracts is also noted and a small tonnage of tie plates has been placed. The purchase of a round tonnage of rails by a railroad which buys in this market is also under consideration. An active buying of traction rails during the past 10 days includes 600 tons for an Indiana interurban line, 1280 tons of girder rails and 400 tons of guard rails for the Detroit United Railways and 250 tons of girder rails for delivery in the Northwest, all with the Pennsylvania Steel Company. The Lorain Steel Company also secured 620 tons for the Detroit United Railways. We quote standard railroad spikes at 1.50c to 1.55c., base; track bolts with square nuts, 2c. to 2.10c., base, all in carload lots, Chicago; tie plates, \$26 to \$28 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

**Structural Material.**—General contractors' figures covering the construction of the municipal pier, in which there will be close to 7000 tons of steel, have been received but no award has been made and there is rumor that a readvertising of the bids is to follow. Contracts have not yet been drawn but it is understood that the American Bridge Company is the successful bidder for the Lake street bridge at Chicago. This will take close to 2500 tons. The Muehlebach Hotel at Kansas City, calling for 2000 tons, has been placed with the Kansas City Structural Steel Company. Other contracts placed during the week include 357 tons for highway bridges, Humboldt County, Cal., to the American Bridge Company; 590 tons, the Powers Building, Decatur, Ill., to the Decatur Bridge Company; 348 tons, Santa Fe passenger station, San Diego, Cal., to the American Bridge Company; 222 tons, highway bridges, Sartell, Minn., to the Minneapolis Steel & Machinery Company; 379 tons, highway bridges, Lake County, Ind.; 300 tons, St. Patrick's Church, San Francisco, to the McClintic-Marshall Company; 158 tons, the Palace Amusement Company, Rockford, Ill., to the Holmes-Pyott Company; 219 tons, Haw-Simmons Hardware Company, Ottumwa, Ia.; 105 tons, Sanitary District of Chicago, to the Milwaukee Bridge Company; 106 tons, a temporary span for the city of Chicago, to the Strobel Steel Construction Company. A number of orders for structural shapes were placed to cover contracts recently taken by fabricators and prices were generally on

the basis of 1.33c., Chicago. For less desirable specifications 1.38c., Chicago, has been secured in several instances within the past few days. The inquiry of the Illinois Central Railroad for 3000 cars has not yet been closed. We quote for Chicago delivery of plain shapes, from mill, 1.33c. to 1.38c., Chicago.

We quote for Chicago delivery of structural shapes, from store, 1.75c.

**Plates.**—Specifications from fabricators during the week have carried a fair tonnage of plates. For these consumers have generally paid 1.33c., Chicago, but the market as applied to the better class of specifications is far from firm at the above price. We quote for Chicago delivery, from mill, 1.33c.

We quote for Chicago delivery of plates from store, 1.75c.

**Sheets.**—Except in so far as the steadily increasing famine is paving the way for keener competition the sheet situation is not greatly changed from the condition reported a week ago. Close buyers continue to find 1.85c., Pittsburgh, for black sheets and 2.85c. for galvanized very difficult to beat. We quote for Chicago delivery from mill: No. 10 blue annealed, 1.53c.; No. 28 black, 2.03c. to 2.08c.; No. 28 galvanized, 3.03c. to 3.08c.

For sheets out of store we quote for Chicago delivery as follows, minimum prices applying on bundles of 25 or more: No. 10 blue annealed, 1.95c.; No. 28 black, 2.45c. to 2.55c.; No. 28 galvanized, 3.50c. to 3.60c.

**Bars.**—The merchant mills in this district continue better fortified as to business than most other departments, but the month of May will come close to finishing business now in sight. For most of the manufacturers the months of July and August are a closed book. There is a very fair demand for reinforcing bars and a number of sales are noted. The bar-iron market is now openly on the basis of 1.10c., and business is very scarce. We quote for mill shipments as follows: Bar iron, 1.10c. to 1.15c.; soft steel bars, 1.33c.; hard steel bars, 1.30c.; shafting in carloads, 65 per cent. off; less than carloads, 60 per cent. off.

We quote store prices for Chicago delivery: Soft steel bars, 1.65c.; bar iron, 1.65c.; reinforcing bars, 1.65c. base, with 5c. extra for twisting in sizes  $\frac{1}{2}$  in. and over and usual card extras for smaller sizes; shafting 60 per cent. off.

**Rivets and Bolts.**—Except for such comment as reflects the too prevalent concession in prices the business in these products is devoid of interest. We quote from mill as follows: Carriage bolts up to  $\frac{3}{8}$  x 6 in., rolled thread, 80-5; cut thread, 80; larger sizes, 75-5; machine bolts up to  $\frac{3}{8}$  x 4 in., rolled thread, 80-10; cut thread, 80-5; larger sizes, 75-10; coach screws, 80-15; hot pressed nuts, square head, \$6.20 off per cwt.; hexagon, \$7 off per cwt. Structural rivets,  $\frac{1}{2}$  to  $1\frac{1}{4}$  in., 1.73c. to 1.78c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 2.35c.; boiler rivets, 2.55c.; machine bolts up to  $\frac{3}{8}$  x 4 in., 75-10; larger sizes, 70-10-5; carriage bolts up to  $\frac{3}{8}$  x 6 in., 75-5; larger sizes, 70-10 off; hot pressed nuts, square head, \$6, and hexagon, \$6.70 off per cwt.

**Hoops and Bands.**—The week brought out a small amount of new business in hoops, but the trade is buying in a perfunctory manner and limiting its purchases to requirements which cannot be neglected. We quote for Chicago delivery of bands, 1.33c. to 1.38c., and for hoops 1.43c. to 1.48c.

**Wire Products.**—The wire trade, with the possible exception of wire for the manufacture of specialties, is sharing in the general business depression. The buying power of the farming communities appears to have been curtailed in all directions. We quote to jobbers as follows: Plain wire, No. 9 and coarser, base, \$1.58; wire nails, \$1.78; painted barb wire, \$1.78; galvanized, \$2.18; polished staples, \$1.78; galvanized, \$2.13, all Chicago.

**Cast-Iron Pipe.**—At Cincinnati the 2700 tons of 24-in. pipe has been awarded to the American Cast Iron Pipe Company. No other business of importance matured, but makers are engaged in an active struggle to secure a contract at Highland Park, Mich. We quote as follows, per net ton, Chicago: Water pipe, 4 in., \$26; 6 to 12 in., \$24; 16 in. and up, \$23.50, with \$1 extra for gas pipe.

**Old Material.**—A very listless attitude on the part of local consumers has eliminated the temporary support upon which the local scrap market displayed a brief showing of strength. While prices are not quotably lower in many instances they are decidedly weak as quoted. Railroad offerings of scrap are meager and include 1500 tons from the Wabash, 700 tons from the Chicago & Alton and 250 tons from the Toledo, St. Louis & Western. We quote, for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton	
Old iron rails	\$12.75 to \$13.25
Old steel rails, rerolling	11.50 to 12.00
Old steel rails, less than 3 ft.	10.50 to 11.00
Relaying rails, standard section, subject to inspection	24.00
Old carwheels	11.50 to 11.75
Heavy melting steel scrap	10.00 to 10.50
Frogs, switches and guards, cut apart	10.00 to 10.50
Shoveling steel	9.25 to 9.75
Steel axle turnings	6.75 to 7.25

Per Net Ton	
Iron angles and splice bars	\$12.25 to \$12.75
Iron arch bars and transoms	12.25 to 12.75
Steel angle bars	9.00 to 9.50
Iron car axles	17.50 to 18.00
Steel car axles	12.50 to 13.00
No. 1 railroad wrought	9.00 to 9.50
No. 2 railroad wrought	8.75 to 9.00
Cut forge	8.75 to 9.00
Steel knuckles and couplers	9.25 to 9.75
Steel springs	9.50 to 10.00
Locomotive tires, smooth	10.00 to 10.25
Machine shop turnings	5.25 to 5.75
Cast borings	4.50 to 5.00
No. 1 busheling	7.50 to 8.00
No. 2 busheling	6.00 to 6.50
No. 1 boilers, cut to sheets and rings	6.50 to 7.00
Boiler punchings	9.25 to 9.75
No. 1 cast scrap	10.25 to 10.50
Stove plate and light cast scrap	9.25 to 9.50
Grate bars	9.00 to 9.50
Railroad malleable	9.25 to 9.75
Agricultural malleable	8.00 to 8.50
Pipes and flues	6.75 to 7.25

## Philadelphia

PHILADELPHIA, PA., May 5, 1914.

The lack of demand is uniform in all directions, prices have become a trifle more ragged and a lower level is more generally admitted in the case of large lots of finished and semi-finished products. A local maker of billets shut down for a week because of a strike and did not regret the temporary suspension of operations. In structural shapes there is very little stirring, and while 1.30c., Philadelphia, is still quoted, attractive business would bring out less. Plates and steel bars are not active, and the actual market is nearer 1.25c., Philadelphia, on good-sized orders. The current demand, which can be compared to supplying jobbing quantities, brings a few points more. Foreign bars landed here have been found to be so unsatisfactory in quality that they are eliminated as a serious factor in the market. The recent decline in sheets is more fixed, and some apprehension is felt over possible importations on the Pacific coast. Good transactions in pig iron are scarce, the aggregate of small sales is not great and there is occasional mention of cuts below quoted prices. Orders for cast-iron pipe are mostly small and prices continue irregular. A little more interest is shown in coke. Old materials are dull and several reductions are noted.

**Iron Ore.**—Imports of ore at this port are all against old contracts, some of them of nearly a year's standing. New buying of foreign ore is at a standstill, with consumers in a waiting attitude. A little interest has been manifested in Lake ore but it has not resulted in sales. Some of the available ores are not considered rich enough to smelt profitably at prevailing quotations for iron, and better prices for the latter, or lower prices for soft rich ore, are needed to stimulate buying. Imports last week were 7047 tons from Sweden, 283 tons from Scotland, 6256 tons from Spain, 7800 tons from Newfoundland and 4800 tons from Cuba.

**Pig Iron.**—A lull more pronounced than has heretofore prevailed in the present depression has settled over this market. Small quantities continue to be sold, but even these are fewer. The largest quantity sold in

the week by one representative firm was 100 tons, the other sales on its books running between that amount and 25 tons. There are current reports of a few sales of more attractive tonnage, but these are difficult to confirm and few admissions as to price are made with regard to them. Mention is made of a sale of basic to a mill in eastern Pennsylvania, at least 1000 tons being taken. A couple of hundred tons of standard low phosphorus was sold at \$21, and a New England buyer is understood to have taken about 1000 tons of high phosphorus iron at a low price. While the quoted prices for standard eastern Pennsylvania No. 2X foundry are \$15 to \$15.25, the lower figure is nearer the actual market, as there are more frequent assertions that \$14.80 or \$14.85 has been done, although sellers will not admit that they figured in the transactions. In Virginia iron there is little doing, new business being light and deliveries against contracts not full, but prices are unchanged. Business has not improved with the steel casting foundries, and at least one Wilmington malleable iron foundry is operating far under its normal rate. Wabana iron, of which so much has been said lately, is not being actively pushed, one reason being that there is not much profit in it at the price at which it has been offered. Small sales have been made, principally for experimental purposes. Except for the tinge of weakness referred to, the following range of prices represents the general market for near delivery in buyers' yards in this district:

Eastern Penna. No. 2 X foundry	\$15.00 to \$15.25
Eastern Penna. No. 2 plain	14.75 to 15.00
Virginia No. 2 X foundry	15.55 to 15.75
Virginia No. 2 plain	15.30 to 15.55
Gray forge	14.00
Basic	14.25
Standard low phosphorus	21.00

**Ferroalloys.**—Except for an occasional sale of a carload lot of 80 per cent. ferromanganese for prompt delivery, the market is inactive. Quotations are unchanged at \$39, seaboard, for English and \$38 for German. Ferrosilicon quotations for 50 per cent. material have not deviated from the range of \$71 to \$73, Pittsburgh, in amounts ranging from carloads to 600 tons and over.

**Cast-Iron Pipe.**—Current business continues to be made up of comparatively small lots. Big propositions are wanting everywhere, except in New York, though the completion of financing in certain sections of the country will mean some fair-sized orders. In the South a little betterment is reported. It is said that those who led in recent price cutting did not get the business they sought and competition is still keen. The average quotation for 6-in. pipe is about \$21.50 per net ton, standard weight, in carload lots at the foundry, with 4-in. \$2 higher and larger sizes 50c. less.

**Billets.**—Makers have practically no new business despite the reduction of \$1 per ton on open hearth rolling billets, now quoted at \$22.40 to \$23.40 per ton. Forging steel commands an advance of \$4 to \$5 per ton. The Alan Wood Iron & Steel Company was a non-producer during the greater part of last week, because of a strike at its Conshohocken mill, but operations were resumed again yesterday. A small group of laborers who handled materials demanded an advance in wages on April 27, and when the company refused to accede they went out. The disaffection spread to other laborers and so interrupted operations that the officers shut down the mill for the remainder of the week. During the idle period the company hurried a crane to the plant and perfected arrangements to eliminate the manual labor which the men had been doing. About 30 were discharged.

**Structural Material.**—Very little business is pending, locally, barring the 1000 tons which will be required by the Delaware, Lackawanna & Western Coal Company for a breaker and some light railroad demand, about the best of which is a 250-ton bridge for the Pennsylvania Railroad. Business of unusual importance might be taken at 1.25c., Philadelphia, which is on a basis of 1.10c., Pittsburgh. The current run of business still brings 1.30c., Philadelphia.

**Bars.**—The demand from merchants for steel bars is lighter than is usual at this season. Quotations are

1.25c. to 1.30c., Philadelphia, depending on quantity. Foreign steel bars, such as have arrived at this port, do not promise to be a serious factor in the trade. It is reported that 200 tons of German bars which have been landed are so badly finished, crooked and rusted, as to be unacceptable. Iron bars are quiet at 1.12½c. to 1.17½c. at the mill, equal to 1.20c. to 1.25c., delivered here.

**Plates.**—Only miscellaneous inquiry and orders are stirring and they are irregular. For desirable business 1.25c., Philadelphia, can be done easily, though car-load lots run five points higher.

**Sheets.**—No. 10 blue annealed sheets are quoted in good-sized quantities at 1.50c., Philadelphia, with smaller lots at 1.55c. As in other products, new business is light. Eastern mills which have been making shipments to the Pacific coast are investigating efforts made there by Belgium or German makers to secure business by offering sheets at extremely low prices, the foreign bids being substantially lower than the American even when the lowest freight rate to the coast is figured on the domestic product. Pacific coast consumers have shown some disposition to test the imported sheets.

**Old Material.**—Consumers are not buying, though there is no dissatisfaction on their part with prices. Railroad offerings to dealers are about normal. Most of the local dealers attended and made purchases at the auction sale of the personal property of the Longmead Iron Works near here. The machinery, etc., was sold in lots, about \$21,500 being realized. The following quotations about represent the market for deliveries in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates varying from 35c. to \$1.35 per gross ton:

No. 1 heavy melting steel	\$10.50 to \$11.00
Old steel rails, rerolling	12.25 to 12.75
Low phosphorus heavy melting steel scrap	14.50 to 15.00
Old steel axles	14.00 to 14.50
Old iron axles (nominal)	20.00 to 21.00
Old iron rails (nominal)	15.50 to 16.00
Old carwheels	11.75 to 12.25
No. 1 railroad wrought	13.00 to 13.50
Wrought-iron pipe	10.00 to 10.50
No. 1 forge fire	8.00 to 8.50
Bundled sheets	8.00 to 8.50
No. 2 light iron	5.00 to 5.50
No. 2 busheling	8.00 to 8.50
Wrought turnings	7.50 to 8.00
Cast borings	8.00 to 8.50
No. 1 cast	12.50 to 13.00
Grate bars, railroad	8.50 to 9.00
Stove plate	8.75 to 9.25
Railroad malleable	9.00 to 9.50

**Coke.**—A slightly better demand for prompt shipment furnace coke has been felt, with a trifle more inquiry also for third-quarter delivery. The indications are, however, considering present conditions, that contract coke will be placed this year later than usual. Standard Connellsville contract coke is firm at \$2 per net ton at oven, with spot at \$1.80 to \$1.90. Prompt and contract Connellsville foundry coke are quoted at \$2.35 to \$2.50 per net ton at oven. Freight rates to this city from the producing districts are as follows: Connellsville, \$2.05; Mountain, \$1.65; Latrobe, \$1.85.

## Cleveland

CLEVELAND, OHIO, May 5, 1914.

**Iron Ore.**—Lake Superior ore prices for 1914 have been established on the 1912 basis, which means a reduction of 65c. a ton on Bessemer grades as compared with last year and a reduction of 50c. on old range non-Bessemer and 55c. on Mesaba non-Bessemer. The new prices are: Old range Bessemer, \$3.75; Mesaba Bessemer, \$3.50; old range non-Bessemer, \$3; Mesaba non-Bessemer, \$2.85. The reduction is about what had been expected for some time. The new prices were announced Saturday and have so far resulted in very little buying. There is practically no inquiry. About the only contracts placed are by consumers interested in mines. Some reservations previously made have been converted into contracts at the new prices. There is little prospect of an early buying movement that usually follows the establishment of prices. Most furnace companies have all the ore they will need for some time

and are taking no interest in the market. Ore salesmen have canvassed the Eastern trade quite thoroughly recently and the indications are that only a very small tonnage of Lake Superior ore will be sold for shipment to the Eastern furnaces this year. Vessels carrying charges will probably be reduced 5c. a ton to the rate that prevailed in 1912. Taken altogether the outlook in the ore trade is very unsatisfactory. It is expected that the buying will drag through the season and that shipments during 1914 will fall off 10,000,000 to 12,000,000 tons from those of last year when they were close to 50,000,000 tons. At the new price it is claimed that many of the underground mines cannot be operated profitably. Some of the shaft properties that shut down a few months ago will not start up again this season and others that are still being operated will probably be shut down. Lake ore shipments during April were only 269,686 tons as compared with 866,387 tons during April, 1913. May shipments will be very light.

**Pig Iron.**—A northern Ohio steel plant has an inquiry out for 15,000 tons of basic pig iron for third quarter delivery. The demand for foundry iron continues very dull. No inquiries are coming out for last half delivery and there is little prospect of a buying movement before next month. Some small lot sales of Southern iron for early delivery are being made at \$10.50, Birmingham, for No. 2. While prices on Northern iron will not be tested until the general buying movement, it is not believed that the reduction in ore prices will have any effect on pig iron prices, as the reduction in ore prices has been discounted and most furnace companies are now making pig iron at a loss. We quote delivered Cleveland as follows:

Bessemer	\$14.90
Basic	13.90
Northern No. 2 foundry	14.25
Southern No. 2 foundry	14.85
Gray forge	13.50
Jackson Co. silvery, 8 per cent. silicon	17.55
Standard low phosphorus, Valley fcc.	\$20.50 to 20.75

**Coke.**—A Cleveland furnace interest reports that it bought last week several thousand tons of furnace coke covering its May requirements at \$1.75. Most standard makes are being held at \$1.85 to \$1.90 per net ton at oven. Several small lot sales of foundry coke to supply early needs are reported. We quote standard 72-hr. foundry coke at \$2.40 to \$2.65.

**Finished Iron and Steel.**—Some of the mills report slight improvement in current orders, but the market generally is very dull and unless there is an early improvement of business, a further curtailment of production will be necessary. Some consumers have allowed their stocks to run very low and are ordering a little more freely, being influenced perhaps by the fact that prices are being well maintained and are not likely to go lower. During the past few days the market has been tested by an offer of 1.10c. for round tonnage of steel bars, but no mill was willing to shade the 1.15c. price to take the business and the order was not placed. Structural material is also being held firmly at 1.15c., and most of the shading on plates is by smaller mills. New structural demand is light and fabricators have little work ahead. While there is a fair amount of sheet business coming out, the demand is below the productive capacity of the mills and prices are weak. One or two of the larger Ohio mills that have been trying to get \$1 a ton higher and have been making some sales on that basis are now openly making quotations of 1.85c. for No. 28 black, 2.85c. for No. 28 galvanized and 1.40c. for No. 10 blue annealed for delivery until July. These prices fairly represent the market at present. A local mill agency has booked an order for 500 tons of standard section rails. An inquiry is pending for 500 tons of forging billets. Bar iron continues in light demand with prices unchanged at 1.20c. to 1.25c. Cleveland. We quote warehouse prices at 1.80c. for steel bars and 1.90c. for plates and structural material.

**Bolts and Rivets.**—The market is quiet, new demand being light. Rivet specifications continue good. Prices are stationary at 1.55c. for structural and 1.65c. for boiler rivets for round lots. We quote discounts as follows: Common carriage bolts,  $\frac{1}{2} \times 6$  in. smaller

or shorter, rolled thread, 80 and 5 per cent.; cut thread, 80 per cent.; larger or longer, 75 and 5 per cent.; machine bolts with h.p. nuts,  $\frac{3}{8}$  x 4 in., smaller or shorter, rolled thread, 80 and 10 per cent.; cut thread, 80 and 5 per cent.; larger or longer, 75 and 10 per cent.; coach and lag screws, 80 and 15 per cent.; square h.p. nuts, blank or tapped, \$6.30 off; hexagon h.p. nuts, blank or tapped, \$7.20 off; c. p. c. and t. square nuts; blank or tapped, \$6 off; hexagon,  $\frac{3}{8}$  in. and larger, \$7.20 off; 9-16 in. and smaller, \$7.80 off; semi-finished hexagon nuts,  $\frac{3}{8}$  in. and larger, 85, 10 and 5 per cent.; 9-16 in. and smaller, 85, 10, 10 and 5 per cent.

**Old Material.**—As there is practically no local demand, Cleveland dealers are devoting about all their attention to the Valley mills, which are doing some buying. Cleveland mills are taking little material on contract. The absence of a demand has resulted in a further weakening of prices on some grades. Heavy steel scrap is weaker in the Valley. While most Valley mills are reported to be willing to pay \$11.75, one Ohio consumer is offering only \$11. We quote f.o.b. Cleveland as follows:

*Per Gross Ton*

Old steel rails, rerolling	\$11.50 to \$12.00
Old iron rails	13.50 to 14.00
Steel car axles	15.00 to 15.25
Heavy melting steel	10.25 to 10.75
Old carwheels	11.50 to 12.00
Relying rails, 50 lb. and over	23.00 to 25.00
Agricultural malleable	8.50 to 9.00
Railroad malleable	10.75 to 11.00
Light bundled sheet scrap	7.50 to 8.00

*Per Net Ton*

Iron car axles	\$17.25 to \$18.25
Cast borings	5.75 to 6.25
Iron and steel turnings and drillings	5.25 to 5.50
Steel axle turnings	6.75 to 7.25
No. 1 busheling, new	8.50 to 8.75
No. 1 busheling, old	8.00 to 8.25
No. 1 railroad wrought	9.50 to 10.00
No. 1 cast	10.50 to 10.75
Stove plate	7.50 to 8.00

## Buffalo

BUFFALO, N. Y., May 5, 1914.

**Pig Iron.**—New buying is practically at a standstill; 1500 tons, all grades, would cover purchases in this district for the week. A fair tonnage of iron is going out from furnaces on old contracts. Inquiry from New England and eastern Pennsylvania points, including one 1000-ton lot, foundry grades, from the latter district, has not yet materialized into orders. Prices are unchanged. We quote as follows for first half delivery, f.o.b. Buffalo, 25c. per ton being added for Buffalo city delivery:

No. 1 foundry	\$14.00 to \$14.25
No. 2 X foundry	13.50 to 14.00
No. 2 plain	13.25 to 13.75
No. 3 foundry	13.00 to 13.25
Gray forge	13.00
Malleable	13.75 to 14.25
Basic	13.75 to 14.25
Charcoal, regular brands and analysis	15.75 to 16.75
Charcoal, special brands and analysis	20.50

**Finished Iron and Steel.**—A number of buyers made efforts to secure prices below 1.15c., Pittsburgh, for round tonnages of structural steel and bars, but without success. There is less business moving at 1.20c. than last week. The Pittsburgh Screw & Bolt Company has taken 160 tons of stay-bolts and screw-bolts for the United States Ship Canal Lock, Black Rock Harbor, Buffalo. Cramp & Co., New York, have the general contract for the Ward bakery, Buffalo, requiring 700 tons of reinforcing bars. The 250 tons of corrugated bars for the Connecting Terminal railroad elevator, Buffalo, went to the Corrugated Bar Company, this city, the Lackawanna Steel Company taking 280 tons of plain flats and rounds and the Buffalo Structural Steel Company 500 tons of structural steel. The latter company also has 975 tons for the Poppenberg store and loft building, Buffalo. The Utica Engine & Boiler Works received the steel contract for the Citizens Trust & Deposit building, Utica, and the Dominion Bridge Company, 1200 tons for the Abitibi Power & Paper Company, Iroquois Falls, Ont. Bids are being taken for the Masonic Temple, Toronto, 350 tons; grain elevator, feed mill and dryhouse for the Consolidated

Milling Company, Buffalo, 250 tons, besides considerable reinforcing bars.

**Old Material.**—The market is in an extremely dull and unsettled condition, little business moving. Prices for old steel axles, machine shop turnings and busheling scrap have softened. In other lines prices remain unchanged. We quote as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	\$10.00 to \$10.50
Low phosphorus steel	14.50 to 15.00
Boiler plate sheared	11.50 to 12.00
No. 1 railroad wrought scrap	11.00 to 11.50
No. 1 railroad and machinery cast	11.50 to 12.00
Old steel axles	12.75 to 13.25
Old iron axles	21.50 to 22.00
Old carwheels	11.50 to 12.00
Railroad malleable	10.25 to 10.75
Machine shop turnings	5.25 to 5.75
Heavy axle turnings	7.50 to 8.25
Clean cast borings	6.00 to 6.50
Old iron rails	15.00 to 15.50
Locomotive grate bars	9.50 to 10.00
Stove plate (net tons)	9.75 to 10.00
Wrought pipe	7.50 to 8.00
Bundled sheet scrap	6.25 to 6.50
No. 1 busheling scrap	8.25 to 8.75
No. 2 busheling scrap	5.75 to 6.25
Bundled tin scrap	10.50

## Cincinnati

CINCINNATI, OHIO, May 6, 1914.—(By Wire.)

**Pig Iron.**—The month of April is said to have been the dullest in the history of the trade here. A few contracts were placed last week for foundry iron for future shipment. One central Indiana melter bought 1100 tons, about equally divided between Northern and Southern brands, for delivery during the next five months. Purchases in this immediate vicinity remain confined to carload lots to fill in. Buying for the last half will have to be made at an early date, unless melters decide to continue their policy of providing only for immediate needs. Southern prices are somewhat uncertain, but nothing lower than \$10.50, Birmingham, can be done, although there appears to be some foundation for rumors that this figure has been inserted in a few small contracts for shipment through the remainder of the year and in some instances for strictly last half delivery. Prices in the Hanging Rock district are unchanged, \$13.50 representing the minimum that any furnace will quote for nearby shipment. An advance of 50c. a ton is asked for last half delivery. The foundry melt in this territory is at a low ebb, and producers apparently are of the opinion that lower prices would not bring out any additional business. The Ohio silvery irons are more active. Approximately 1000 tons was bought by two Indiana users for this year's shipment, and there is an additional small inquiry under negotiation. A northern Ohio manufacturer is testing the market with an inquiry for 1000 tons of malleable. Based on freight rates of \$3.25 from Birmingham and \$1.20 from Ironton we quote f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft	\$14.25 to \$14.75
Southern coke, No. 2 f'dry and 2 soft	13.75 to 14.25
Southern coke, No. 3 foundry	13.25 to 13.75
Southern No. 4 foundry	12.75 to 13.25
Southern gray forge	12.25 to 12.75
Ohio silvery, 8 per cent. silicon	17.20 to 17.70
Southern Ohio coke, No. 1	15.70 to 16.20
Southern Ohio coke, No. 2	14.70 to 15.20
Southern Ohio coke, No. 3	14.45 to 14.70
Southern Ohio malleable Bessemer	14.70 to 15.20
Basic, Northern	14.70 to 15.20
Lake Superior charcoal	16.25 to 17.25
Standard Southern carwheel	27.25 to 27.75

*(By Mail)*

**Coke.**—The foundries are unusually slow in contracting for their future supply. The question of price does not now seem to concern them. At this time of the year there is generally a fair demand for foundry coke when many buyers make contracts for a last half supply, but buying is now confined to carload lots that are urgently needed. In several instances, it is stated, consumers are holding up shipments on old contracts. Furnace coke is extremely dull and in all districts is obtainable around \$1.85 to \$2 per net ton at oven. Foundry coke is quoted at \$2.50 to \$2.75 per net ton at oven.

**Finished Material.**—The market is very quiet in every line. At this season there is generally a demand for building material, but this has not yet developed.

A small tonnage of concrete bars is being ordered, but mostly by outside customers. Store quotations on steel bars are 1.75c. to 1.80c., and on small structural shapes from 1.85c. to 1.90c., cut to length when desired. Reports from the nearby rolling mills indicate that the demand for both black and galvanized sheets is very slack. Prices are unchanged in this market.

**Old Material.**—The market is very weak. Prices are unstable and the accumulated stocks of dealers make them rather indifferent buyers. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b. at yards:

*Per Gross Ton*

Bundled sheet scrap	\$7.00 to	\$7.50
Old iron rails	12.00 to	12.50
Relaying rails, 50 lb. and up	20.00 to	20.50
Rerolling steel rails	11.00 to	11.50
Melting steel rails	9.50 to	10.00
Old carwheels	10.50 to	11.00

*Per Net Ton*

No. 1 railroad wrought	\$9.00 to	\$9.50
Cast borings	4.75 to	5.25
Steel turnings	4.75 to	5.50
Railroad cast scrap	9.50 to	10.00
No. 1 machinery cast scrap	10.50 to	11.50
Burnt scrap	6.25 to	7.00
Old iron axles	17.00 to	17.50
Locomotive tires (smooth inside)	10.00 to	10.50
Pipes and flues	6.50 to	7.00
Malleable and steel scrap	7.50 to	8.00
Railroad tank and sheet scrap	5.50 to	6.00

## Birmingham

BIRMINGHAM, ALA., May 4, 1914.

**Pig Iron.**—No change has occurred beyond perhaps an intensification of the stagnation. One large maker reports total sales of not over 2500 tons in April. Another sold about the same amount. Nothing is being done outside of sales of carload lots and other small tonnage orders. These small lots are for Southern delivery and are bringing an average of \$10.75 at furnace, some bringing \$11. Any considerable amount of iron could be had at \$10.50 even for forward delivery, although the asking price for third quarter is generally \$11. Some iron has recently gone to Nova Scotia stove foundries, regular customers of the Birmingham district. Shipments were via Brunswick, Ga. There is a tendency on the part of iron operators to consider much of the Eastern and Middle Western trade as permanently lost to Southern furnaces, and the hope of the future is the further expansion of Southern foundries. The dividend on the common stock of the Tennessee Coal, Iron & Railroad Company inspired some optimism, this having come after \$15,000,000 has been expended in betterments since acquisition by the United States Steel Corporation. Local pig-iron consumption has been increased by the going on of the National Cast Iron Pipe Company's plant and extension of activities at the wire mill of the American Steel & Wire Company at Fairfield. The sanitary pipe factories are also large consumers. A buying movement is considered inevitable in the next few weeks. Whether that will establish lower or higher levels is a question. We continue to quote, per gross ton, f.o.b. furnaces, as follows:

No. 1 foundry and soft	\$11.00 to	\$11.50
No. 2 foundry and soft	10.50 to	11.00
No. 3 foundry	10.00 to	10.50
No. 4 foundry	9.75 to	10.25
Gray forge	9.50 to	10.00
Basic	10.25 to	10.75
Charcoal	23.25 to	23.75

**Cast-Iron Pipe.**—Water and gas pipe manufacturers are operating plants on curtailed capacity and in this way are taking care of a moderate volume of small orders. The sanitary pipe shops continue active and are securing fair prices for the output. During the past week additional orders were received. We quote, per net ton, f.o.b. factories, as follows: 4 in., \$21.50; 6 in. and upward, \$19.50.

**Coal and Coke.**—The coal situation is a trifle better, the taking on of regular stocks being larger than expected. One explanation of idleness at a number of mines is given in the remarkable mine development of the past few years without a coequal extension of trade territory. Coke is somewhat firmer, the limited output

being largely responsible for it. Effort is being made to put Birmingham coke in Pensacola, where Virginia coke now enjoys a large trade owing to freight rates that, considering distance, are lower than Birmingham's, being \$2.70 from Virginia and \$1.70 from Birmingham, less than one-third the distance. We quote, per net ton, f.o.b. oven, as follows: Furnace coke, \$2.60 to \$2.90; foundry, \$3.15 to \$3.40.

**Old Material.**—Scrap is as quiet as pig iron, with small business going in the lighter grades. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old iron axles	\$14.50 to	\$15.00
Old steel axles	14.50 to	15.00
Old iron rails	13.00 to	13.50
No. 1 railroad wrought	10.00 to	11.00
No. 2 railroad wrought	8.50 to	9.00
No. 1 country wrought	9.00 to	10.00
No. 2 country wrought	8.00 to	9.00
No. 1 machinery cast	9.50 to	10.00
No. 1 steel scrap	8.00 to	8.50
Tram carwheels	9.50 to	10.00
Standard carwheels	10.50 to	11.00
Stove plate	8.00 to	8.50

## Boston

BOSTON, MASS., May 5, 1914.

**Old Material.**—Again the dealers report no change in conditions or prices. Transactions are few; the volume of business is very small. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of \$2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices:

Heavy melting steel	\$8.25 to	\$8.50
Low phosphorus steel	13.75 to	14.75
Old steel axles	13.25 to	13.75
Old iron axles	21.25 to	21.75
Mixed shafting	12.75 to	13.00
No. 1 wrought and soft steel	9.00 to	9.25
Skeleton (bundled)	5.75 to	6.25
Wrought-iron pipe	7.75 to	8.00
Cotton ties (bundled)	6.00 to	6.25
No. 2 light	3.75 to	4.25
Wrought turnings	5.00 to	5.50
Cast borings	5.00 to	5.50
Machinery, cast	11.25 to	11.50
Malleable	8.00 to	8.25
Stove plate	7.75 to	8.00
Grate bars	6.25 to	6.50
Cast-iron carwheels	11.00 to	11.25

## St. Louis

ST. LOUIS, MO., May 4, 1914.

**Pig Iron.**—A well spread demand for small quantities coupled with a number of good sized orders has convinced representatives that past purchases have been steadily melted and that there will be readiness to contract for the last half before long. The large sales of the week were 10,000 tons of Northern basic, taken by a Chicago furnace; 5000 tons of basic, also to Northern interests, and 500 tons of Lake Superior car-wheel iron. The larger basic transaction is understood to have been made on a basis of \$14.50 Granite City, equivalent to \$13, Chicago. An inquiry for 2000 tons of malleable remains unfilled, but will probably be closed shortly.

**Coke.**—Sales of by-product coke have been increasing, and one interest reports transactions aggregating about 10,000 tons with more to be made shortly. There is reason to assume that concessions below the figure for Connellsburg and Virginia product are being made.

**Finished Iron and Steel.**—The principal transaction was the letting of the Muhlbach hotel contract at Kansas City, the Kansas City Structural Company getting the steel, about 1800 tons. Buying is entirely for immediate needs. Fabricators, however, are keeping pretty steadily busy. Reinforcing bars are in increasing demand and the movement in this territory at the present time is good. In standard section steel rails inquiries for interurban use, one of 1000 tons and one of 2000 tons, are in the market.

**Old Material.**—Dealers have reached the conclusion that the bottom has been reached and are beginning to buy to lay down in their yards. At that quotations are strictly nominal and transactions are altogether based

on the individual feeling of buyer and seller at the moment of the transaction. The only business actually removing is some cast scrap and steel to foundries. Re-laying rails are a little better than the rest of the market. Lists out include 150 tons from the Vandalia and 2000 tons from the Missouri Pacific. We quote dealers' prices, with the reservation noted, f.o.b. St. Louis, as follows:

## Per Gross Ton

Old iron rails	\$10.75 to \$11.25
Old steel rails, re-rolling	10.50 to 11.00
Old steel rails, less than 3 feet	10.50 to 10.75
Re-laying rails, standard section, subject to inspection	21.00 to 23.00
Old carwheels	10.50 to 11.00
No. 1 railroad heavy melting steel scrap	9.75 to 10.25
Shoveling steel	8.25 to 8.75
Frogs, switches and guards cut apart	9.75 to 10.25
Bundled sheet scrap	4.50 to 5.00

## Per Net Ton

Iron angle bars	\$10.25 to \$10.75
Steel angle bars	8.50 to 9.00
Iron car axles	16.75 to 17.25
Steel car axles	11.75 to 12.25
Wrought arch bars and transoms	11.25 to 11.75
No. 1 railroad wrought	7.75 to 8.25
No. 2 railroad wrought	7.50 to 8.00
Railroad springs	8.75 to 9.25
Steel couplers and knuckles	8.75 to 9.25
Locomotive tires, 42 in. and over, smooth	9.00 to 9.50
No. 1 dealers' forge	7.25 to 7.75
Mixed borings	3.25 to 3.75
No. 1 busheling	7.25 to 7.75
No. 1 boilers, cut to sheets and rings	5.50 to 6.00
No. 1 cast scrap	9.25 to 9.75
Stove plate and light cast scrap	7.75 to 8.25
Railroad malleable	7.50 to 8.00
Agricultural malleable	7.00 to 7.50
Pipes and flues	5.50 to 6.00
Railroad sheet and tank scrap	5.75 to 6.25
Railroad grate bars	6.75 to 7.25
Machine shop turnings	4.25 to 4.75

## San Francisco

SAN FRANCISCO, CAL., April 28, 1914.

Business still fails to show the animation usual at this season. This is partly due to the continued depression of resale prices, because of which merchants take little satisfaction in such business as they get; but even more to the general refusal of buyers to purchase beyond nearby requirements. Some encouragement, however, is taken from the condition of consuming trades, as neither merchants nor manufacturers now have any large stocks to draw upon, and a few scattering orders for large lots are coming out. A little uneasiness has been caused by the interruption of Tehuantepec traffic and the diversion of freight to the Magellan route, which may delay the arrival of steel from the Atlantic seaboard. Otherwise, the Mexican situation has had no effect here. No large buying in anticipation of the future is to be expected until conditions of Panama Canal traffic are established.

**Bars.**—Very little contracting for foreign bars for importation has occurred for some time. Buyers are reluctant to take the large quantities necessary for import business. A considerable tonnage is arriving on old orders, however, and this stock is used quite largely in the jobbing trade. Business in soft steel bars is fairly active in a small way, but few orders of any consequence are appearing. Inquiries for reinforcing material are gradually increasing, but actual bookings are limited, while prices remain low.

**Structural Material.**—With the letting of the Commercial Fireproof building at Los Angeles to the Llewellyn Iron Works, about 2350 tons, the tonnage for the Pacific coast holds up fairly well. Locally, however, recent bookings are of little importance, and new inquiries are slow to appear, though there are a good many moderate-sized jobs in architects' hands. A small contract has been let for ferry aprons, and the Western Iron Works has taken the Fireman's Fund job. The McGilvray Construction Company's warehouse at Sacramento, about 100 tons, is figuring, and bids are in for a postoffice at Berkeley, Cal. Plans are coming out for a lot of State buildings, but they will take little steel. Very low figures are still the rule for fabricated work.

**Rails.**—Some business in light rails has been booked of late, but consists almost entirely of small orders.

Some larger propositions are being figured, however, and a better movement is expected in the near future. Business in heavy rails is limited to a few scattering carloads, no definite inquiries of importance coming out locally.

**Plates.**—Specifications on old contracts continue to come out in good volume, but requirements for the work now in hand have been pretty well covered, and new business is rather slow. Prospects are still favorable for additional tank, pipe and marine work, but there is a little lull at the moment, and neither merchants nor consumers are disposed to anticipate their requirements. Merchants are depending almost entirely on the local stock of the leading interest for current supplies, keeping their own stocks at an absolute minimum.

**Sheets.**—The tonnage of galvanized sheets, both on specifications and new orders, is satisfactory, but other lines are moving in only a limited way. The improvement in galvanized reflects an actual consuming demand, as stocks are light and most orders are for prompt shipment, with no desire anywhere to accumulate large lots.

**Standard Pipe.**—The local plumbing supply business is still somewhat depressed, but distributive business in the country has picked up in good shape, and the movement is about up to normal for this season. There is a fair scattering of waterworks orders, but oilfield business has slackened off. Talk of a new pipe line for the Dutch Shell Company has not resulted in anything definite. Merchants are buying only for the most urgent needs, and this, together with the condition of resale prices, causes a general feeling of dissatisfaction.

**Cast-Iron Pipe.**—The Sacramento contract has been placed with the Mark-Lally Company, which will also furnish a few cars for Daly City. San Diego will open bids May 4 for about 200 tons, and Healdsburg, Cal., takes figures on a small lot the same day. Small contracts have been placed by Santa Cruz, Pasadena and El Centro, Cal. Business from private corporations keeps up fairly well.

**Pig Iron.**—Current foundry requirements have not perceptibly increased, and most melters have enough stock on hand to enable them to keep out of the market. There is no disposition to buy for future shipment, and importers are having some difficulty in moving the tonnage already on hand. No. 2 Southern foundry iron is quoted nominally at about \$21 per gross ton, but none of any consequence can be sold at present. Prices of foreign iron are irregular.

**Coke.**—It is still difficult to interest local buyers in foreign coke for current loading, though some lots are being placed. Current requirements are pretty well covered, and there is no activity at the yards. German Syndicate coke, ex yard, is quoted at \$13 to \$14 per net ton.

**Old Material.**—The scrap market continues dull, with practically no interest on the part of local consumers. The larger consumers of steel melting scrap have shown no disposition to enter the market, and their probable requirements are filled for some time to come, while offerings have appeared at a range of \$5 to \$7 per gross ton. Recent sales of wrought scrap have been at about \$5 to \$6 per net ton, but there is no demand at present. Cast-iron scrap is moving in a small way only, at about \$16 per net ton.

## New York

NEW YORK, May 6, 1914.

**Pig Iron.**—In some directions a little more activity appears, even though the general aspect has not changed. Two inquiries for 3000 tons are before the Eastern trade, one from a Connecticut melter, calling for various grades of foundry iron and the other from Newark, N. J., the latter being for second half delivery. One alleged transaction which has been commented on rather freely was represented to involve 1000 tons of high-phosphorus iron (or 1500 tons according to one report) for a consumer in Massa-

chusetts. While it has been reported that a sale was made and \$15.45, delivered, was named as the basis, it is understood that if there was any purchase it was for a small amount and that on the bulk of the iron the matter is still open. The first New England cargo of Nova Scotia iron was unloaded this week at Bridgeport, Conn. It amounted to 1100 tons. Some of this Dominion iron, which recently went by boat to Philadelphia, was sent by rail to eastern Massachusetts, the freight being \$1.90. The prices at which Nova Scotia iron has been sold have realized little if any profit for the producer, in view of the concessions necessary to introduce it in competition with well known irons. It is reported that another Nova Scotia producer has a surplus of pig iron that will be offered in the East, but no sales can be traced thus far. Several 100-ton lots of pig iron have been sold in the past week in New Jersey and New England territory, and furnace-men are not counting on any great increase from this scale of business in the near future. Foundries appear to have enough iron bought to carry them through the next 60 days as a rule, and the tendency is to a less rather than a greater rate of foundry operations. In New England foundries are working four or five days a week in most cases, and here and there only half time is made. We continue to quote Northern iron for tidewater delivery as follows: No. 1 foundry, \$15 to \$15.25; No. 2 X, \$14.75 to \$15; No. 2 plain, \$14.50 to \$14.75; Southern iron, \$15 to \$15.50 for No. 1 and \$14.75 to \$15 for No. 2.

**Finished Iron and Steel.**—Irregularities in prices spell the occasional anxiety for business, but the repeated instances of the general quotations' being held—the fact of larger importance—indicate the underlying belief that little is to be gained at this time by price concessions, owing to the paucity of business. Two large structural steel projects were recently closed on the basis of 1.10c., Pittsburgh, for the plain material from Eastern mills, but moderate tonnages, even with regular buyers, are held at 1.15c. Some of the other irregularities cover a quotation which figures back to 1.20c., Eastern plate mill, so that the delivered price is a shade under ruling figures, and an instance of 1300 tons, delivered to the Panama Canal at a price corresponding to about 1.07c., Pittsburgh. In general a steady run of business ensues, but for individually small amounts, and the cases are not few of 1.20c. and higher being obtained. In the Eastern section of the country there is about 20,000 tons of structural work pending, to a greater or less degree active, exclusive of subway construction and little of it of the speculative nature. None of the 6000 freight cars, referred to the last report, have been closed, and in addition the Havana Central is inquiring for 260 freight cars and 40 caboose cars and the Delaware, Lackawanna & Western is feeling the market for upward of 500 hopper cars, so far as best information goes. The largest structural work placed include 2800 tons for the Rogers Peet Building, about 2000 tons for the building on Vanderbilt avenue and Forty-fifth street, both given to the Hay Foundry & Iron Works, and 2500 tons for the Washington Southern & Richmond, Fredericksburg & Potomac, reported awarded to the Phoenix Iron Works. The Pressed Steel Car Company is to build 8 passenger cars for the Erie, and the Standard Steel Car Company 4 chair cars for the Erie. As covering the greater run of business, we quote mill shipments of steel bars, plates and structural material at 1.15c., Pittsburgh, or 1.31c., New York, and iron bars at 1.22½c. to 1.27½c., New York. For lots from store, we quote bar iron and steel bars at 1.80c. to 1.85c., New York, and shapes and plates at 1.85c. to 1.90c.

**Cast-Iron Pipe.**—The Department of Water Supply of New York City, having in charge the distribution of Catskill water, will open bids May 12 on 1600 tons of 48-in. for the Borough of Richmond (Staten Island). This is the only public letting of importance in sight at present. On the pipe to be purchased by Yonkers, N. Y., on which proposals were opened April 27, the lowest bidder on 1153 tons of 30-in. named \$20.61 delivered, and on 425 tons of 6 and 8-in. \$21.70 delivered. Prices on lettings at points in Massachusetts last week ranged from \$22 to \$22.50 delivered. The private buy-

ing is about normal for the season. Quotations on carload lots of 6-in. are \$22 to \$23 per net ton, tidewater.

**Ferroalloys.**—An absence of inquiries and sales, except a few small lots, characterizes the market for both 80 per cent. ferromanganese and 50 per cent. ferrosilicon. Quotations for the former remain at \$39, seaboard, for English, while the German product is offered at \$38. Ferrosilicon is selling at from \$71 to \$73, Pittsburgh, according to the tonnage involved.

**Old Material.**—Noteworthy in a week of light business was a sale of a considerable quantity of cast scrap to a foundry at Newark, N. J., for extended delivery. Small lots of borings and turnings have been sold, but rolling-mill stock generally has been exceedingly quiet. Railroad wrought scrap is especially weak, with offerings at low prices failing to induce buying by consumers, who look for a still lower level. It is understood that a large Eastern consumer refused to take a lot offered at \$11.50, delivered. Steel scrap is in some demand from dealers for the purpose of covering on old contracts, but consumers are purchasing little or nothing. The railroad lists out this month are of about the usual size for May, except that of the Pennsylvania Railroad, which is quite heavy. The following quotations, per gross ton, New York, are made by dealers:

Old girder and T rails for melting	\$8.00 to \$8.50
Heavy melting steel scrap	8.00 to 8.50
Relying rails	21.50 to 22.00
Reshaping rails	10.00 to 10.50
Iron car axles	17.50 to 18.00
Steel car axles	11.75 to 12.25
No. 1 railroad wrought	10.00 to 10.50
Wrought-iron track scrap	9.00 to 9.50
No. 1 yard wrought, long	8.50 to 9.00
No. 1 yard wrought, short	8.00 to 8.50
Light iron	3.25 to 3.50
Cast borings	5.75 to 6.25
Wrought turnings	5.50 to 6.00
Wrought pipe	8.00 to 8.50
Carwheels	10.00 to 10.50
No. 1 heavy cast, broken up	10.50 to 11.00
Stove plate	7.50 to 8.00
Locomotive grate bars	6.00 to 6.50
Malleable cast	7.25 to 7.75

The Joseph Joseph & Brothers Company, old material, has moved its offices from 50 Church street to much larger quarters in suite 506, Woolworth Building, New York City.

## German Prices Still Weak

### Steel Bars and Plates Lower—Better Demand for Shapes—New Rod Combination

BERLIN, April 23, 1914.

The weak and sluggish condition of the iron trade continues. The reports of the past few days mention further reductions on bars and plates. It is said that steel bars are now being offered generally in the Rhine-Westphalian district at 93 to 94 marks (\$22.13 to \$22.37), and that consumers show little disposition to place contracts of any considerable size at these prices. In slight contrast to the rest of the market it is reported to-day from the Luxemburg district that the trade there has latterly grown somewhat better. Nevertheless, the calls for shipment of pig iron are at times very unsatisfactory there, and some of the works have had to stock large quantities. Luxemburg mills making reinforcing bars for concrete work and also the finer classes of bars are busy, chiefly on foreign orders. Work on ordinary structural shapes is also more active.

The Steel Works Union met to-day and gave out its usual monthly survey of the market. It says that there have been no considerable changes in the home trade in semi-finished steel, and that consumers are still working on an unsatisfactory volume of orders. The foreign markets are quiet. The Prussian railroads have given orders for further quantities of supplies for the new fiscal year, and the minor German railroads have also sent in some orders. A number of orders from foreign countries for steel rails have recently been taken, but trade with South American countries has become quieter in consequence of the unfavorable business conditions

prevailing there. In rails for mines orders for the current quarter are of about the same volume as last year, and the incoming specifications are keeping up to the level of last month. Some large home and foreign orders in grooved rails have recently been booked. The home trade in structural shapes has further improved since the end of March and recent reports indicate that the building trade is becoming more active. The foreign demand for structural shapes has also improved, and specifications are coming in at a satisfactory rate. Reports from European countries indicate that the volume of business this year will be about up to last year's level; but the reports from oversea countries are not encouraging.

A review of conditions in the Essen region shows that the market is very quiet and prices are unsteady; only in structural shapes is there a better tendency. It is reported that the great Hoesch Works at Dortmund is offering bars for the September quarter at 90 to 92 marks (\$21.42 to \$21.90), net cash at works, and it is added that some of the new southwestern mills are offering bars at 87 to 88 marks (\$20.71 to \$20.94). The plate market is kept under heavy pressure by over-production, but it is believed that prices have now reached their lowest point. In the Siegerland region the mills have little to do and are compelled to restrict production. Some of the smaller mills there are offering thin plates as low as 112 marks (\$26.66), with 1½ per cent. discount. Bars for concrete construction are also in better demand in the Essen region. The market for steel tubes is still greatly demoralized, and price-cutting continues.

A meeting of the Wire Rod Association will be held in about two weeks, for the purpose, as it now appears, of voting its own dissolution. On the other hand, the organization of five important producers of rods and 35 wire mills, which has been previously mentioned in this correspondence, is now about perfected. It is announced that it will go into operation July 1, with headquarters at Düsseldorf. It will take the form of a limited liability company, with a small capital, under the name of Deutscher Walzdrahtverband. The five works in question are Rombach, de Wendel, Burbach-Eich-Düdelingen (Luxemburg-Lorrain district), Röchling (Saar district) and Kraft (the old Niederrheinische-Hütte, now attached to the Kraftwerke of Prince Donnersmarck). The mills will deliver rods to the wire mills at a fixed price and buy the finished wire from them, also at a fixed price. The new organization will produce more than half of the rods made in Germany.

## British Trade Unimproved

**Semi-Finished Steel Affected by Weakness of Continental Markets—Pig Iron Dull but Firm**

(By Cable)

LONDON, ENGLAND, May 6, 1914.

Buying of semi-finished steel by the general trade is very reserved, and the tone is affected by the weakness of Continental markets. Pig iron is dull but firm, and with diminishing stocks a further advance is quite possible. The political situation is regarded as better. The number of blast furnaces in operation in Scotland, Cleveland and Cumberland is 169, against 210 at the same time a year ago. Receipts of tin plates have been 160,000 boxes; shipments, 171,000 boxes; stocks, 326,000 boxes. The Standard Oil Company is inquiring for tin plates. Stocks of pig iron in Connal's stores are 96,432 gross tons, against 102,592 tons a week ago. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 12s. 6d. (\$3.04), against 12s. 7½d. (\$3.07) a week ago.

The following prices are per ton of 2240 lb.:

Cleveland pig-iron warrants (Tuesday), 51s. 4d. (\$12.49), against 50s. 11½d. (\$12.39) a week ago.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 51s. 7½d. (\$12.56), against 51s. 3d. (\$12.47) a week ago.

Hematite pig iron, f.o.b. Tees, 61s. 9d. (\$15.02), against 61s. 6d. (\$14.96) a week ago.

Sheet bars (Welsh), delivered at works in Swansea Valley, £4 10s. (\$21.89).

Steel bars, export, f.o.b. Clyde, £5 15s. (\$27.98), against £6 (\$29.20) a week ago.

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £5 12s. 6d. (\$27.37).

Steel ship plates, Scotch, delivered local yards, £5 17s. 6d. (\$28.59).

Steel black sheets, No. 28, export, f.o.b. Liverpool, £8 15s. (\$42.58).

Steel rails, export, f.o.b. works port, £5 12s. 6d. (\$27.37).

The following prices are per export ton of 1015 kilos, equivalent to 2237.669 lb.:

German sheet bars, f.o.b. Antwerp, 75s. (\$18.25).

German 2-in. billets, f.o.b. Antwerp, 73s. (\$17.75).

German basic steel bars, f.o.b. Antwerp, £4 3s. to £4 4s. (\$20.19 to \$20.43), against £4 4s. to £4 5s. (\$20.43 to \$20.68) a week ago.

German joists, f.o.b. Antwerp, £5 2s. to £5 5s. (\$24.82 to \$25.55).

Freight rates from Antwerp to New York, Boston, Philadelphia and Baltimore, per 1000 kilos (2204 lb.), are about as follows: Billets, blooms and bars, up to 20 ft., 9s. to 10s. (\$2.19 to \$2.43). Iron and steel sheets, 11s. to 12s. 6d. (\$2.68 to \$3.04). Beams up to 30 ft., 12s. 6d. (\$3.04).

## Metal Market

NEW YORK, May 6, 1914.

### The Week's Prices

Cents Per Pound for Early Delivery

May	Lake	Electro-	Tin,	Lead		Spelter	
				New	St.	New	St.
29.....	14.50	14.12½	34.65	3.90	3.80	5.00	4.85
30.....	14.50	14.25	34.25	3.90	3.80	5.00	4.85
1.....	14.50	14.25	34.10	3.90	3.80	5.00	4.85
2.....	14.50	14.25	.....	3.90	3.80	5.00	4.85
4.....	14.50	14.20	33.82½	3.90	3.80	5.00	4.85
5.....	14.50	14.20	33.10	3.90	3.80	5.00	4.85

Copper is quiet though sellers are offering concessions. Tin has been moderately active at lower prices. Lead is dull but firm. Spelter has been dull but its price level has been even. Cookson's antimony is a little stronger but the situation generally is unchanged.

### New York

**Copper.**—The market has been quiet, a condition which is attributed to the action of the large sellers in advancing their price for electrolytic last week from 14.25c., 30 days, delivered, to 14.37½c. At the lower price a fair business developed but it was effectually checked by the advance. The large agencies are still adhering to 14.37½c., 30 days, but evidently realize that buyers will not take hold at that price and are offering concessions. The metal can be had easily at 14.20c., cash, New York, and probably 10 points lower if the right seller is found. Some high grade Lake has been sold at 14.50c., cash, and more could be had at that figure, but there is little demand, despite a slight improvement in the demand for rolled sheet copper in the last week. Since the end of the strike in the Lake Superior region, Lake is rapidly resuming a normal position. Quotations in London this morning were £63 5s. for spot and £63 10s. for futures. Exports this month total 4650 tons. In April 34,787 tons was exported.

**Copper Averages.**—The Waterbury average for the month of April was 14.87½c. The average New York price for Lake copper, based on daily quotations in *The Iron Age*, was 14.75c., and for electrolytic, 14.38c.

**Tin.**—At the lower prices, more interest has been shown in futures and there has been a moderate amount of buying for August and September delivery, some for July and a little for June. This buying was scarcely enough to lift the market from its quiet state. There is conviction that any improvement in the general

trade will quickly mean a good movement in tin, but meanwhile the market may go lower despite the fact that it is to-day down to 33.10c. Deliveries into consumption in April were good, amounting to 4300 tons, although total deliveries for four months of this year show a decrease of 900 tons, as compared with the same time last year. The total visible supply on April 30, 1914, was 15,447 tons, or 5625 tons above the total supply of April 30, 1913. In stock and landing, April 30, was 2538 tons. London quotations to-day are £149 5s. for spot and £151 5s. for futures. The arrivals this month total 494 tons and there is afloat 1900 tons.

**Lead.**—This metal is dull, but it has a better tone than either tin or copper; in fact, it is strong and the trade looks for an advance. Consumers would take June if they could get it, but sellers are unwilling to let go at present prices. The best that can be done is 3.80c., St. Louis, and 3.90c., New York.

**Spelter.**—Dullness has been about the only feature although there were indications of slightly better inquiry yesterday and some sellers were asking 4.90c., St. Louis. Business can be done, however, at 5c., New York, and 4.85c., St. Louis.

**Antimony.**—In Cookson's there has been a little improvement and 7.25c. to 7.35c. is quoted. Hallett's is unchanged at 6.75c. to 6.95c. and other grades range from 5.75c. to 6.25c.

**Old Metals.**—The demand has not improved. Dealers' selling prices are nominally as follows:

	Cents per lb.
Copper, heavy and crucible	13.75 to 14.00
Copper, heavy and wire	13.25 to 13.50
Copper, light and bottoms	12.50 to 12.75
Brass, heavy	9.00 to 9.25
Brass, light	7.75 to 8.00
Heavy machine composition	12.25 to 12.50
Clean brass turnings	8.75 to 9.00
Composition turnings	11.25 to 11.50
Lead, heavy	3.65
Lead, tea	3.40
Zinc scrap	4.25

### Chicago

**MAY 4.**—Although the number of orders placed in the metal market was fairly satisfactory the general situation is weak with the exception of lead. Copper quotations are down, and tin prices, which have been tobogganing for some time, are still on the down grade. Spelter is weak. We quote as follows: Casting copper, 14.50c.; Lake copper, 14.75c. to 14.87½c. for prompt shipment; small lots, ¼c. to ¾c. higher; pig tin, carloads, 34.75c.; small lots, 36.75c.; lead, desilverized, 3.85c. and corroding, 4.10c., for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5c.; Cookson's antimony, 9.50c. for cask lots; other grades, 8c.; sheet zinc, \$7, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 11.75c.; copper bottoms, 10.50c.; copper clips, 11c.; red brass, 10.75c.; yellow brass, 7.50c.; lead pipe, 3.30c.; zinc, 3.50c.; pewter, No. 1, 23c.; tinfoil, 26c.; block tin pipe, 29c.

### St. Louis

**MAY 4.**—The market on lead and spelter has strengthened somewhat. Lead is quotable at 3.85c.; spelter, 4.90c.; Lake copper, 14.85c.; electrolytic copper, 14.72½c.; tin, 34.10c. to 34.60c.; Cookson's antimony, 7.60c. In the Joplin ore market the better feeding toward the end of the week had its effect on prices, but a greater quantity of the lower grade ores was sold at prices somewhat off than was the case the week before. The range for 60 per cent. was \$35 to \$40 per ton with the top price \$43. Calamine was rather weak at \$19 to \$20 for 40 per cent. ore, with the best settlements at \$25. Sales of 80 per cent. lead ore were made at \$46, an advance of \$1. Miscellaneous scrap metals are quoted as follows: Zinc, 3c.; lead, 3.25c.; tea lead, 3c.; light brass, 6c.; heavy yellow brass, 8c.; heavy red brass and light copper, 10c.; heavy copper and copper wire, 11c.; pewter, 23c.; tinfoil, 29c.

The N. & G. Taylor Company, Philadelphia, which has an open-hearth steel works at Cumberland, Md., containing two 25-ton open-hearth furnaces, plans to double its capacity this fall.

### Iron and Industrial Stocks

NEW YORK, May 6, 1914.

Values of securities have appreciated considerably in the past week with the absence of unfavorable developments in Mexico and indications that the Eastern railroads will shortly be favored with permission to advance their freight rates to some extent. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com.	11 1/2 - 11 1/4	Nat. En. & St., com.	10 - 11
Allis-Chal., pref.	42 - 42 1/2	Pressed Stl., com.	10 1/2 - 43 1/2
Am. Can, com.	24 1/2 - 27 1/2	Ry. Spring, com.	27 1/2 - 27 1/2
Am. Can, pref.	88 1/2 - 91 1/2	Republic, com.	21 1/2 - 23
Am. Car & Fdy., com.	47 1/2 - 49 1/2	Republic, pref.	85 - 85 1/2
Am. Car & Fdy., pref.	117 1/2 - 118	Rumely Co., com.	8 - 10
Am. Loco., com.	29 1/2 - 31	Rumely Co., pref.	24 - 28
Am. Loco., pref.	97 1/2 - 98 1/2	Sloss, com.	26
Am. Steel Fdries.	30 - 31	Pipe, com.	9 1/2
Bald. Loco., com.	47 - 48	Pipe, pref.	33 1/2
Bald. Loco., pref.	108	U. S. Steel, com.	57 - 60 1/2
Beth. Steel, com.	39 1/2 - 41 1/2	U. S. Steel, pref.	107 1/2 - 109 1/2
Beth. Steel, pref.	83 - 85 1/2	Va. I. C. & Coke.	42
Case (J. L.)	82 - 82 1/2	West'gh'se Elec.	72 - 75 1/2
Colorado Fuel.	26 1/2 - 28 1/2	Am. Ship, pref.	80
Deere & Co., pref.	94	Chic. Pneu. Tool	51 1/2 - 54 1/2
General Electric.	144 - 147 1/2	Cambria Steel.	45 1/2 - 47 1/2
Gt. N. Ore Cert.	30 1/2 - 33	Lake Sup. Corp.	18 1/2 - 19 1/2
Int. Harv., com.	103 1/2 - 105 1/2	Pa. Steel, pref.	64 - 64 1/2
Int. Harv., pref.	116	Cruc. Steel, com.	14 1/2 - 15
Int. Harv. Corp.	101 1/2 - 103 1/2	Cruc. Steel, pref.	90 - 90 1/2
Int. Harv. Corp., pref.	116	Harb. Wk. Ref., pref.	98 1/2
Int. Pump, pref.	20 1/2 - 21	La Belle Iron, com.	35 1/2 - 36 1/2

### Dividends Declared

The Eastern Steel Company, regular quarterly, 1 1/4 per cent. on the first preferred stock, payable June 15.

The Inland Steel Company, regular quarterly, 1 1/4 per cent., payable June 1.

The Tennessee Coal, Iron & Railroad Company, 1 per cent. on the common stock. This is the first dividend since the 1907 panic, prior to which 1 per cent. quarterly had been paid on the common from May 1, 1905, to November 1, 1907. At present there is \$124,000 preferred outstanding which pays 8 per cent. annually.

The American Radiator Company, quarterly, 2 1/2 per cent. on the common stock, payable June 30. The company has heretofore paid 2 per cent. quarterly, with an extra 2 per cent. in March. The company also declared a regular quarterly 1 1/4 per cent. on the preferred stock, payable May 15.

The Standard Sanitary Mfg. Company, regular quarterly, 1 1/4 per cent. on the preferred stock and 1 1/2 per cent. on the common stock.

Deere & Co., regular quarterly, 1 1/4 per cent. on the preferred stock, payable June 1.

L. Vogelstein & Co., 42 Broadway, New York, furnish the following figures of German consumption of foreign copper for the months January to March, 1914: Imports, 55,555 tons; exports, 1933 tons; consumption, 53,622 tons. This compares with consumption during the same period of 1913 of 44,955 tons. Of the above imports 48,399 tons came from the United States.

The Southern Railway has completed the placing of 10 orders calling for 75 locomotives, 32 going to the Baldwin Locomotive Works, 30 to the American Locomotive Company and 13 to the Lima Locomotive Corporation. The St. Louis, Brownsville & Mexico Railway has ordered 15 consolidation type locomotives from the Baldwin Locomotive Works.

The standardization of pipe threads for gas and electric fixtures and conduit fittings is to be undertaken by a committee which the council of the American Society of Mechanical Engineers has voted to appoint. It is planned that this work will supplement that of the International Committee on Pipe Threads.

The offices of Eaton, Rhodes & Co., Pittsburgh, dealers in pig iron and coke, Joseph G. Walton, resident manager, have been removed from room 1428 to 1642 Oliver Building, Pittsburgh.

A spindle 22 ft. 5 1/2 in. long for one of the country's large sheet mills has recently been made with the pads of the wobblers treated by the Stroh hardening process.

## NEW FOUNDRY IN NEWARK

Business Founded By Seth Boyden in 1826 Now  
Has Model Plant

The new plant of the Barlow Foundry Company, Newark, N. J., was inspected May 2 by several hundred of the company's patrons, friends and others interested in the growth of Newark's foundry and metal working trades. A buffet luncheon was served from 12 to 4 o'clock. The new foundry is located at 551 New Jersey Railroad avenue, in an entirely different locality from the old one at 28 Orange street, which in the not distant future will be given over to other purposes.

Much of the interest attached to the completion of the new foundry lies in the fact that in the old one, which was founded by Seth Boyden in 1826, were made the first malleable iron castings produced in the United States. It was here that Boyden experimented for more than six years and achieved success, a fact which the citizens of Newark have commemorated by the erection of a statue of him in a nearby city park.

The plans for the new works, which were prepared and have been so far carried out by Walter Kidde, engineer, 90 West street, New York, provide for three connected buildings in the shape of a U. Two of the buildings are now completed and nearly equipped—a foundry, 60 x 180 ft., and a building, 100 x 200 ft., to be used for general purposes, and which is to connect the two foundry structures. The additional foundry wing yet to be constructed will be 70 x 280 ft. All the buildings are one-story. The construction adopted, steel with brick walls and cement tile roofing, makes the plant fireproof. The foundry has a central high monitor and is equipped with a 5-ton Niles crane which can be operated from the floor as well as from a cage. The interior of both buildings is cheerful, well-ventilated and as light as outdoors, inasmuch as the side walls are almost entirely of glass, while a flood of light comes from above. The foundry is surrounded by a number of ventilators. The roof of the large building is of saw-tooth construction, with window sash fitted with Drouvé operators. This building contains the general offices of the company, shipping department, cleaning and sand-blast department, carpenter and pattern shop and fireproof pattern storage. Three large doorways, with metal doors hung on inclined rails, give access to the cleaning department from the foundry. In the cleaning room are 4 Whiting exhaust barrels connected with a dust arrester and a Paxson sand-blast machine. Electric power is used throughout the plant.

Down one side of the foundry is a row of molders' benches and shelves, the benches in the form of cast-iron brackets built into the brick-work of the wall, while the shelves are of concrete. One corner is devoted to core ovens and core work. A 60-in. cupola and No. 6B Wilbraham-Green blower with electric chain drive, as well as other equipment, were installed by the J. W. Paxson Company, Philadelphia. Access to the charging floor is by means of a spiral stairway, while materials are raised by an Otis plunger elevator, the entrance to which is within a few feet of bins in which materials are stored. Ladles are carried from the cupola to within the radius of the traveling crane by a smaller crane carried on two girders.

Running parallel with the foundry is a spur of the Pennsylvania Railroad, which, after entering the company's grounds, rises on a trestle under

which are bins for the storage of sand, coal, coke, etc. Trucks which are to make local deliveries are loaded at the doors of the shipping room. In the case of rail shipments, the products are taken on shop trucks to an elevator of the Otis plunger type, which lifts them to a platform adjacent to the railroad track and on a level with the car floor, thereby minimizing handling and enabling the utilization of a single track for both loading and unloading. Valuable ground space is also conserved.

The comfort of the workmen has been well looked after, the provision for them including steel lockers, sanitary toilets, facilities for washing with hot water and a comfortable room where they may eat their luncheons with clean surroundings. The plant is steam heated, and tungsten lamps of 100 and 250 watts are provided for lighting.

The entire property, embracing between three and four acres, is surrounded by wire fencing with concrete posts, concrete rods being bent inward at the top of the posts to carry several strands of barbed wire. The sign of the company, mounted on the roof and facing the tracks of the Pennsylvania Railroad, is made of iron letters 18 and 20 in. high, which were cast by the Barlow Foundry Company and enameled white by the Mott Iron Works, making a sign which is indestructible and one which easily can be restored to its original whiteness should it become stained.

The officers of the Barlow Foundry Company are: A. E. Barlow, president; William H. Nichols, vice-president; Joseph McCartney, secretary and general manager, and Richard H. Gatling, treasurer. Mr. Gatling is a son of Dr. Gatling of machine gun fame. The directors consist of the officers, and A. Parker Nevin, counsel to the National Association of Manufacturers; R. L. Riker, who is connected with the Prudential Life Insurance Company, and Joseph M. Perrine, a contractor of Jamesburg, N. J.

The history of the company, which makes both malleable and gray iron castings, is summarized in the following names under which it has been known since it was founded: Seth Boyden, 1826-1835; Boston Malleable Cast Iron & Steel Company, 1835-1837; Condit & Bolles, 1837-1843; Daniel Condit, 1843-1858; Condit & Barlow, 1858-1862; Condit, Barlow & Shove, 1862-1866; Barlow & Shove, 1866-1870; J. H. Barlow, 1870-1879; J. H. Barlow & Condit, 1879-1882; Barlow, Condit & Morris, 1882-1895; Morris & Barlow, 1895-1899; Arthur E. Barlow, 1899-1907; Barlow Foundry Company, 1907.

Masson Limitée, Ramsay and Marche streets, Quebec, Canada, has succeeded to the business of A. D. Masson, dealer in machinery, tools, construction materials, etc. The new directors are: Damase Masson, merchant, formerly president of the Chamber of Commerce of Montreal, and Auguste D. Masson and Jean Masson, of the firm of A. D. Masson. E. D. Kellogg, specialist in steel construction, formerly engineer in chief of the Eastern Canada Steel Works Company of Quebec, is a member of the company and will personally direct the steel department. All the directors are residents of Quebec.

A petrol-electric locomotive crane has recently been constructed in Germany at the Aktiengesellschaft Lauchhammer at Lauchhammer. The motive power is furnished by a 40-hp. petrol engine coupled direct to a continuous-current dynamo having a capacity of 23 kw. at 230 volts. The machine runs on eight standard-gauge wheels, each of the inner axles being driven by a 12½-hp. electric motor through bevel-reducing gear. The rotating crane has a capacity of two tons and a radius of action of 32 ft., the cable drum being operated by an 8-hp. motor.

# Economics of a Manufacturing Business

## First of a Short Series of Articles Calculated to Elucidate the Fundamental Facts Which in the Long Run Affect Costs

BY FORREST E. CARDULLO\*

One of the most serious problems presented to our merchants, our manufacturers, our law makers and our engineers is the problem of the cost of making a given article. In a primitive community the cost of any article, whether it be a building, a bushel of wheat, or a bar of iron, is readily determined, since the operations necessary to produce it are known, and the cost of the labor and the value of the materials employed in its production are easily discovered. When however, we consider a modern industrial community the case is quite different. Large scale production, complicated processes, the division of labor, and the employment of vast aggregates of capital become essential features in the machinery of production, and it is no longer easy to discover the cost of doing a given piece of work.

When a blacksmith with a few days labor builds a rude forge, and thereafter for many years employs it in the manufacture of iron articles, made direct from ore which he mines in the neighboring hillside, the cost of an article becomes practically the blacksmith's wages for the time required in its production. If he makes one hundred nails in a day, and his time is worth \$2, the nails are obviously worth 2 cents apiece, and the cost to him of building his forge and keeping it in repair becomes an unconsidered item in the cost of his work.

When however, a nail is made under modern conditions, we find the case to be far different. The nail is made in a machine whose value is a hundred times that of the primitive forge. The cost of building the machine becomes a considerable item in the cost of making the nail. Not only do we have a portion of the wages of the workmen and of the value of the machine as a part of the cost of every nail made, but a thousand other items also form a part of the cost as, for instance, the cost of the power used, the rent of the building in which the operation is performed, the salary of the foreman, who directs the workman, the cost of the materials used, etc. If we try to analyze the elements forming the cost of the material used, we find an endless succession of costs due to the use of labor, the use of capital, or the use of material.

### COMPLEXITY OF TRUE COST DETERMINATIONS

We find capital invested in the great steam shovel which digs the ore from the earth, in the railroad system which transports it, in the great furnace and its auxiliaries which smelt it and in the rolling mill which transforms it into steel rod. Likewise we find coal, supplies of all kinds, coke for the furnace, and various other varieties of material employed in the different processes. Everywhere we find labor directing the machinery, controlling processes, supervising the output, and occasionally actually performing operations necessary for finishing the product.

If we attempt to trace the cost of each piece of equipment employed and each pound of material used, we find that we will be compelled to extend our

investigation not only to every industry at present carried on in this country, but also through history to the time when capital in the form of equipment was not in use. Such an investigation will show us that all cost is originally due to labor, that equipment and material have value because of the labor employed in their production, and that it is because of the labor necessary for their creation that they introduce an element of cost whenever they are employed in the production of any article.

It is obviously impractical to extend an analysis of costs back to the ultimate labor cost. We are compelled to assume in practical cases that the cost of manufacturing any article is formed of three parts; first, the cost of the capital employed, second, the cost of the labor needed, and third, the cost of the material used.

### ELEMENTS OF THE COST OF CAPITAL

The elements which go to make up the cost of capital are six in number. They are interest, depreciation, amortization, insurance, repairs and taxes. Both the nature of these elements and their amount in any given case, is often misunderstood. For example depreciation, amortization and repairs are quite commonly lumped together without any true understanding of their nature. In like manner, it is often considered that the item of insurance need not be charged when no fire insurance is carried, which is an entirely wrong view of the matter. We will consider each of the six elements in turn, discussing their origin, their amounts, and the conditions which affect them.

#### Interest

Interest is that annual return upon capital which is necessary in order to meet the needs of a growing and civilized community for more capital. Capital must increase in amount for two reasons; first, because the community grows in numbers, and second, because the community daily finds use for new forms of capital. Let us take for illustration some particular form of capital, say dwelling houses of a community. As the community increases in population, the number of dwellings required, and therefore their total value, is increased. As the community increases in wealth, the average value of these dwelling houses will also increase, because they will be made larger, and more beautiful and costly forms of construction will be employed. As the community increases in civilization new appurtenances are added to these dwelling houses, e. g. sewers, water pipes, bathrooms, gas, electric lights, etc. It will be seen that the community has need for additional capital, first because it grows in population, second, because the wealth and desires of its members tends to increase, and third, because new inventions and devices increase the number of desirable things. The interest which capital commands as a return upon its investment represents the needs of the community for this increased capital.

Before we can properly understand the principles which determine the rate of interest, and also those which underlie the rates chargeable for the other elements of the cost of capital, we must give

\*Professor of Mechanical Engineering, New Hampshire College, Durham, N. H.

some attention to the matter of compound interest. In compound interest, the interest which accumulates is each year added to the principal. For instance, if \$1 is placed at compound interest at 6 per cent., during the first year 6 cents in interest accrues. During the second year, interest is paid on the amount, which is \$1.06, and the interest accruing during the second year is 6.36 cents. The amount at the end of the second year is \$1.1236. During the third year interest accrues on this amount to the extent of 6.7416 cents and at the end of the year the amount is \$1.191016. Naturally, money at compound interest increases itself more rapidly than money at simple interest. For instance, money at simple interest at 6 per cent. doubles itself in 16 2/3 years. At compound interest, however, it doubles itself in 11.9 years.\*

All forms of profitably invested capital pay annual returns. The annual return so made is available for reinvestment so that if the return paid by capital is reinvested each year at the same rate of interest, the capital will increase in amount in accordance with the laws of compound interest.

I have already stated that the rate of increase which the growing needs of the community requires fixes the normal rate of interest. From the estimates of the U. S. Census Bureau we are able to show the normal rate of increase of capital in the United States since 1850. The figures are as follows:

Date	Approximate wealth	Annual increase, per cent.
1850	\$7,140,000,000	3.11
1860	16,160,000,000	8.41
1870	30,000,000,000	6.48
1880	42,600,000,000	3.81
1890	65,000,000,000	4.08
1900	88,500,000,000	3.07
1904	107,100,000,000	5.37

Thus we see that from 1850 to 1860 the national wealth increased about 8 1/2 per cent. each year; from 1860 to 1870 it increased 6 1/2 per cent. each year; from 1870 to 1880, 3 3/4 per cent. each year; from 1880 to 1890, 4 per cent. each year; 1890 to 1900 3 per cent. each year, and 1900 to 1904, 5 3/4 per cent. each year.

The first two periods represented a time when the United States was rapidly increasing its cultivated area and during which a great amount of wealth was added to the country, not by the labor of its inhabitants, but by the mere fact that land was brought under cultivation. A vast amount of wealth was added at this time also by the California gold mines. From 1900 to 1904 was another extraordinary period, for during this time the rise in prices and increase in values of all kinds (a phenomenon familiarly known as the high cost of living) caused an unusually rapid rate of increase in the normal wealth of the country.

\*The arithmetical methods of computing compound interest are clumsy and slow. There are methods, however, by which compound interest can be computed very easily and quickly when a table of logarithms is at hand. Let  $r$  be the rate of interest expressed as a decimal (i.e. for 3 per cent. interest the rate is 0.03; for 6 per cent. interest, the rate is 0.06, etc.). Let  $P$  equal the principal, let  $A$  equal the amount and let  $n$  equal the number of years during which compound interest accrues. Then, we will have the formula

$$A = P (1 + r)^n$$

In order to solve problems in compound interest by means of this formula, we may write it thus

$$\log A = \log P + n \log (1 + r)$$

For example, if we wish to find the amount of \$100 invested at 4 per cent. compound interest, for 20 years, we will have

$$\log 100 = 2.000000$$

$$\log (1 + 0.04) = .017033$$

$$20 \log 1.04 = .340.660$$

$$\log A = 2.340660$$

$$A = \$219.11$$

If the reader will take a piece of paper and pencil and by the methods that he learned in the "little red schoolhouse," compute the amount, he will discover that the difference in time required is something startling.

During the normal periods it will be seen that the rate of increase of the country's wealth was 3 to 4 per cent. a year, averaging 3.7 per cent. This is the interest rate which is required in order to meet the needs of the United States, and is the normal interest rate at the present time, for growing and civilized communities. It is the interest rate which savings banks usually pay. When however, one attempts to borrow money, he finds it necessary to pay a higher rate than this for several reasons. In the first place he must reimburse the loaner for the risk of his capital, since the normal interest rate presupposes absolute certainty in the return of the principal and the payment of the interest. In the second place, he must pay the expenses of investigating the loan, the cost of book-keeping, the legal expenses, the taxes, if any, and also a sufficient amount to bring the return up to the normal rate in spite of the fact that the capital is idle for a portion of the time. The rate of interest paid upon loans secured by a first mortgage upon real estate in the Eastern United States is usually about 5 per cent. and the difference represents the items which have been mentioned. If a savings bank realizes 5 per cent. upon its investment and pays 3 1/2 per cent. to its depositors, the 1 1/2 per cent. difference represents the cost of collecting the deposits, the cost of keeping them invested, and the taxes which the bank must pay, makes up for the interest lost on that portion of the funds which are not invested profitably, and makes good the occasional losses of principal or defalcations of interest which the bank must endure.

A person engaging in any industrial enterprise expects to receive, in the form of dividends or profits from the enterprise, at least the same rate of interest which he would expect to receive were he lending the money to some one else and accepting a mortgage upon the plant as a security. The rate varies from 5 per cent. to 7 or 8 per cent. according to the nature of the business, the likelihood of its success and the stability of its capital. For example a higher return would be expected from a bicycle factory than from a sewing machine factory, because the demand for sewing machines is fairly constant, while the success of the bicycle business depends on the whim of the public. A high rate of return would be expected from a business in which the machinery was of a special type not useful for any other purpose, and therefore difficult to dispose of to advantage in case of failure of the business. A higher rate of interest must be expected from a railroad built into a new community where the amount of traffic is problematical than for improvements upon a road located upon a settled community where the amount of traffic and its rate of increase is accurately known. A higher rate of interest must be realized upon property which rapidly depreciates in value than upon property which appreciates in value, e. g., the rate would be higher upon real estate located in a run-down community than upon real estate located in a growing community. Government bonds secured by the power of taxation command the normal rate of interest. Bonds of such a company as the Pennsylvania Railroad pay about 4 1/2 per cent. Real estate loans in a growing community command about 5 per cent. An industrial corporation engaged in a business of promise whose probable expansion it is impossible to predict, should receive a higher return. In general, interest rates for conservative public service corporations may be taken at 5 per cent. and for conservative industrial at 6 per cent.

(To be continued.)

## PERSONAL

Leopold E. Block, vice-president of the Inland Steel Company, Chicago, was elected a director of the American Iron and Steel Institute for the term ending May, 1917, at the annual meeting held in New York May 4. Mr. Block succeeds Charles S. Price, formerly president of the Cambria Steel Company, Johnstown, Pa., who has retired from active business. James A. Farrell, Edgar C. Felton, Elbert H. Gary, Robert Hobson, Charles M. Schwab and Powell Stackhouse, whose three-year term expired with this meeting, were re-elected.

M. E. Towner has been appointed special representative of the Whitman & Barnes Mfg. Company, Akron, Ohio, with office at 113 North Second street, St. Louis, Mo.

Joseph Woodward, president and founder of the Woodward Iron Company, Birmingham, Ala., who has been in failing health for some time, is reported as much better. He is still in Florida.

The changes in management of the Woodward Iron Company, owing to the withdrawal of Morris Bush, who was general superintendent, are as follows: John J. Shannon, a veteran furnace man, for years with the Sloss-Sheffield Steel & Iron Company, has been made assistant to the vice-president, A. H. Woodward, and will be general superintendent of all the furnaces of the company at Woodward and Vanderbilt, Ala. B. E. Purser, who has grown up with the Woodward Iron Company, having been in its service for 21 years, and who was mine superintendent at Dolomite, has been made superintendent of all mines.

Dr. M. G. Christie, president of the Otto Coking Company, 6 Church street, New York, arrived this week from Germany, accompanied by officers of the parent Otto oven company. Louis Wilputte, general manager of the Otto Coking Company, recently spent several weeks abroad visiting important plants representing his company's system.

Herbert B. Cox, formerly superintendent of the Empire Steel & Iron Company's operations at its Oxford furnace in New Jersey, is now connected with the Rickwood Company, New York, which is developing a process for the improved preparation of iron ores.

Bradley Stoughton, secretary American Institute of Mining Engineers, sailed for Europe last week for an absence of five or six weeks.

William H. Mills, president of Naylor & Co., Inc., New York, has returned from a trip to England.

William E. Corey returned to New York from Europe last week.

R. F. Pearson, who has been connected with the metal department of Bruce & Cook, 190 Water street, New York, has resigned his position with that firm to become manager of the recently established pig tin department of the North American Copper Company, 164 Front street, New York. The latter company is the sole American agent for the United States and Canada of Ricard & Freiwald, London.

W. L. Kerlin has been appointed New York representative of the Fitchburg Machine Works, Fitchburg, Mass. He will look after territory within a radius of 100 miles of New York City.

E. J. Deckman, 1417 Oliver Building, Pittsburgh, who has recently taken over the account of the Eynon-Evans Mfg. Company for Pittsburgh and vicinity, will also continue to represent the Hoppes Mfg. Company, having been representative of this company in Pittsburgh for over seven years.

Col. Samuel Harden Church, treasurer of the Union Steel Casting Company, Pittsburgh, has been elected president of the board of trustees of the Carnegie Institute of Technology, Pittsburgh, succeeding W. N. Frew, who resigned on account of ill health, after serving for 18 years.

William B. Sullivan, formerly Philadelphia representative of the Carpenter Steel Company, has been appointed Pittsburgh sales agent of the company, with office in the First National Bank Building, 511 Wood street.

Horace L. Haldeman, Philadelphia, was elected president of the Pulaski Iron Company, Pulaski City, Va., at a meeting of the board of directors held at Philadelphia, April 28, succeeding A. J. Dull, deceased. E. P. Borden was elected vice-president and secretary-treasurer and Leonard W. Williams, assistant secretary-treasurer.

E. F. Walker, formerly sales manager of the hydraulic department of the International Steam Pump Company, will represent the Eynon-Evans Mfg. Company in New York and vicinity, with an office at 170 Broadway.

George DeA. Babcock, H. H. Franklin Mfg. Company, Syracuse, N. Y., addressed a meeting of the Efficiency Society of Rochester, N. Y., on May 4, on the results of applied scientific management at the Franklin automobile plant.

R. C. Cole has joined the staff of the pneumatic tool department of the Ingersoll-Rand Company, and has been stationed at the Chicago office.

J. W. Powell, at present connected with the William Cramp & Sons Shipbuilding & Engine Company, Philadelphia, has been elected president of the Fore River Shipbuilding Corporation, Quincy, Mass., succeeding Rear Admiral Francis T. Bowles, who will retain his place on the board of directors.

E. P. Crawford, president McKeesport Tin Plate Company, McKeesport, Pa., has returned from an extensive trip to Panama and South America.

R. H. Watson, formerly superintendent of the open-hearth department of the Homestead works of the Carnegie Steel Company, Homestead, Pa., has been made assistant general superintendent of the entire plant. W. A. Maxwell, formerly assistant superintendent of the open-hearth department, succeeds R. H. Watson as superintendent.

Justin A. Barbour, formerly with the Shuman-Booth Company, Chicago, is now sales manager of the Speedway boat department of the Hoefer Mfg. Company, Freeport, Ill.

Prof. H. E. Ehlers, professor experimental engineering, University of Pennsylvania; W. R. Jones, engineer of construction, University of Pennsylvania; George R. Henderson, consulting engineer, Baldwin Locomotive Works; Prof. R. H. Fernald, University of Pennsylvania; Hugo Bilgram, and D. R. Yarnall, general manager Nelson Valve Company, have been appointed a committee on meetings in Philadelphia for the American Society of Mechanical Engineers.

The Cuyuna Northern Land & Iron Company has been incorporated in Minnesota with a capital of \$250,000 to engage in mining and the buying and selling of mineral lands. It will operate extensively in the Cuyuna iron range. The officers are William D. Washburn, president; C. E. Purdy, vice-president, and Otto J. Borer, secretary-treasurer, all of Minneapolis.

The Algoma Steel Corporation at Sault Ste. Marie, Ont., made new monthly production records in March. The output of pig iron was 30,420 tons as compared with the best previous record of 29,800 tons in April, 1913; of rails, 29,640 tons as compared with 29,200 in July, 1913, and of coke, 40,760 tons as against 37,600 tons in January, 1913.

The Tennessee Coal, Iron & Railroad Company has closed a contract to supply 48,000 tons of by-product coke to the New Orleans Light Company at the rate of 2000 tons per month.

The New York sales office of the Abendroth & Root Mfg. Company, manufacturer of water-tube boilers, has been moved from 50 Church street to 45 Broadway.

## Pittsburgh and Nearby Districts

Last week the First-Second National Bank of Pittsburgh, which closed its doors in July, 1913, resumed business. Practically a new board of directors was elected, which includes a number of men prominent in the steel business of Pittsburgh, as follows: E. R. Crawford, president McKeesport Tin Plate Company; W. L. Curry, of the same company; J. Rogers Flannery, Flannery Bolt Company; J. B. Finley, Colonial Steel Company; William H. Hearne, La Belle Iron Works; J. H. Hillman, Jr., J. H. Hillman & Sons Company; P. W. Morgan, Westinghouse Electric & Mfg. Company, and Charles H. McKee, a director of the Shenango Furnace Company.

The Enterprise Enamel Company, of Bellaire, Ohio, has reduced its capital stock from \$200,000 to \$5000.

At a meeting of stockholders of the Youngstown Iron & Steel Company, held in Youngstown, Ohio, last week, it was voted to increase the capital from \$1,200,000 to \$3,000,000. The additional capital will be used by the company in the building of an open-hearth steel plant to contain three 70-ton open-hearth furnaces and sheet-bar and slab mills. It is understood that the additional capital was nearly all subscribed for by present stockholders of the company. Work on the building of the new steel plant will be started at once and pushed as fast as possible. The plant will be located adjacent to the present sheet mills.

The Allegheny Forging Company has removed its office from the Frick Building Annex to room 1402, Farmers' Bank Building, Pittsburgh.

Orders for 41 all-steel box cars were placed by the Pennsylvania Railroad at its car shops at Altoona, Pa., last week. They are to be built over the X-25 design, which calls for steel underframe, steel body with wooden linings and steel roof—the most modern box car in use. The car is 42 ft. 6 in. long, weighs 49,000 lb., and has a cubical capacity of 3243 ft.

The report that the Republic Iron & Steel Company will build two more batteries of Koppers by-product coke ovens at Youngstown, Ohio, is incorrect. The present plant consists of 68 Koppers ovens, and the Republic Company has no intention of increasing this number at present, but its plans were made and certain parts of the equipment so arranged that two additional batteries, each to contain 68 ovens, can be added at some future time if desired.

The Standard Seamless Tube Company of Pittsburgh, which is building a new plant at Economy, Pa., has ordered five electric cranes from the Cleveland Crane & Engineering Company, Wickliffe, Ohio.

The annual convention of the Amalgamated Association of Iron and Steel Workers opened in Columbus, Ohio, on Tuesday, May 5. The wage committee started its meeting in Columbus, May 1, but its report will likely not be presented to the convention until later this week. No important changes in present rates for puddling and finishing mills are expected to be made in the new scale to be presented to the manufacturers, and which will be effective from July 1.

In April, shop No. 2 at the Rankin, Pa., works of the McClintic-Marshall Company, steel fabricator, made the largest output of any one month in its 14 years' history.

An increase in capital by the iron and steel industries of central and southern Russia is a feature of the last few years. Since the beginning of 1912 eight out of 15 companies have increased their capital by £6,016,130. The largest increase, £1,792,080, was that of the Briansk Company, the next, £1,423,100 being made by the Taganrog Company. Of the total increase £4,849,170 was for the acquisition of collieries and iron ore mines and only £1,166,960 for the extension of iron and steel production. The total capital of the 15 companies of the district is now £20,680,600 as compared with £14,664,470 in January, 1912.

It is not true, as stated in recent newspaper dispatches reporting finds of iron ore in the Saucon Valley, that the Bethlehem Steel Company has either explored for or found ore on the Rentzheimer farm.

## OBITUARY

JOHN T. GARDNER, superintendent of the rolling mills of the Brier Hill Steel Company, Youngstown, Ohio, died in the City Hospital from peritonitis, April 24, aged 56 years. He was born in Buffalo, N. Y., and gained his first rolling-mill experience in 1876 at Rosedale, Kansas, afterward working in mills at Pueblo, Colorado, Chicago, Ill., and Toledo, Ohio. In 1901 he became head roll-turner at the Ohio works of the Carnegie Steel Company, Youngstown, Ohio, and in 1902 was made superintendent of the rolling mills of that plant. He had been connected with the Brier Hill Steel Company for the past two years. He leaves one son and three daughters.

ALONZO PAWLING, Milwaukee, Wis., one of the founders of the Pawling & Harnischfeger Company, died April 30, from pneumonia, aged 57 years. He was born in Chicago. At the age of 27 he moved to Milwaukee and established a small machine shop. With Herman Harnischfeger, he later organized the firm of Pawling & Harnischfeger to manufacture cranes. In July, 1912, Mr. Pawling retired from active business and the firm was incorporated as the Pawling & Harnischfeger Company, with Mr. Harnischfeger as the principal stockholder.

DAVID TILTON, Hartford, Conn., died April 26 from pneumonia, aged 80 years. He became proprietor of the Atlantic Screw Works in 1887 and devised much of the machinery now employed in the product of the factory. He was a native of New Hampshire and served as an apprentice in machine shops in Manchester, removing to Hartford in 1864. He retired in April, 1908, being succeeded by his son, Fred N. Tilton, who now manages the business.

CHARLES L. CUMMINGS, who was head of the Cummings Machine Company which operated a plant in the Bush Terminal Stores until the dissolution of the company about two years ago, died May 5 at his home, the Hotel Chelsea, New York, from pleuro-pneumonia after a short illness. He was a member of the Machinery Club of the City of New York. He leaves a widow.

WILLIAM H. COCHRAN, coal and coke operator, died at his home in Dawson, Pa., May 3, aged 56 years. He was a partner in Cochran Brothers, operating the Spring Grove coke plant, and was also a stockholder in the Washington Coal & Coke Company and the Cosmopolitan Coal Company. He leaves a widow and four children.

The Turner & Seymour Mfg. Company, Torrington, Conn., manufacturer of high grade upholstery and house furnishing hardware, has appointed J. C. McCarty & Co., 29 Murray street, New York City, general selling agents for the United States and Canada. The company, perhaps the oldest manufacturer in its line in the country, has recently added to its plant and proposes to still further specialize in and concentrate upon the product for which it has earned a high reputation. The selling arrangement just made will permit the manufacturing end of the business to give undivided time and attention to the product, while customers will get the advantage of a perfectly equipped and thoroughly organized sales service.

Meetings are to be held by local members of the American Society of Mechanical Engineers at Chicago and Boston, both on May 13. The former, a dinner meeting at the Hotel Sherman, is to take up machine shop practice. The Boston meeting, at the Engineers' Club, is to discuss boiler room practice, led by Capt. Charles H. Manning.

The M. H. Treadwell Company, engaged in the manufacture of industrial railways, portable and permanent track material, cars, etc., has moved its Chicago office to 210 South La Salle Street.

## OUR TRADE WITH MEXICO

### Statistics of Our Exports To and Imports From Mexico in Recent Years

WASHINGTON, D. C., May 6, 1914.—The interruption of our trade with Mexico, which at present amounts to the almost complete cessation of shipments thither, while our imports have dwindled to small figures, invests with special interest some statistics which the Bureau of Foreign and Domestic Commerce has compiled for *The Iron Age*. Administration officials confidently predict that the existing disturbances will speedily be composed and that the restoration of peace will give a great impetus to our trade with Mexico in both imports and exports.

The foreign trade of Mexico for the fiscal year 1913, the latest year for which complete official data are at hand, amounted to \$248,000,000, of which \$150,000,000 represented exports and \$98,000,000 imports. The United States naturally leads all countries as the source of Mexican imports and the destination of Mexican exports, but the disturbed conditions of the past year and a half materially reduced shipments from the United States. Our imports from Mexico of merchandise of all kinds in the calendar year 1911 amounted to \$57,311,632; in 1912 they rose to \$76,767,931 and in 1913 to \$81,877,434. Exports to Mexico do not make so satisfactory a showing. For the calendar year 1911 they aggregated \$53,454,407; for 1912 they amounted to \$56,079,150, but in 1913 they declined to \$48,052,137.

Referring to detailed imports, which are recorded only for fiscal years, the statistics compiled show that in 1913 Mexico supplied us with 18,032,239 lb. of copper ore, matte and regulus, valued at \$2,156,159, as compared with 16,360,946 lb., valued at \$1,843,233 in 1912. Our imports of copper in pigs, ingots, bars, etc., amounted to 112,347,329 lb., valued at \$17,327,140 in 1913, as against 117,062,456 lb., valued at \$14,632,685, in 1912. Mexico is an important source of lead in ore and base bullion, our imports in 1913 amounting to 129,101,915 lb., valued at \$3,064,280, as against 181,046,189 lb., valued at \$3,718,619, in 1912. Zinc ore and calamine were imported in 1913 to the extent of 24,043,109 lb., valued at \$438,513, as compared with 26,832,159 lb., valued at \$485,288, in 1912.

Our exports to Mexico of iron and steel and other metal products have grown steadily in recent years, although the increase was checked in 1913 as the result of disturbed conditions in the mining regions. The United States supplies the bulk of agricultural implements imported into Mexico and in 1913 shipped plows and cultivators to the value of \$219,120, as compared with \$179,032 in 1912; also other agricultural implements and parts to the value of \$393,383 in 1913, as against \$508,217 in 1912. The total exports of brass and manufactures thereof in 1913 were \$201,821, as compared with \$230,242 in 1912. Automobiles to the value of \$533,229 were shipped to Mexico in 1913, as compared with \$466,078 in 1912. Exports of cars for steam railroads aggregated \$462,236 in 1913, as against \$651,768 in 1912, while cars for street and other railroads were valued at \$217,331 in 1913, as compared with \$125,104 in 1912. The total shipments of bicycles in 1913 were valued at \$52,201, as compared with \$53,016 in 1912. Other cars, carriages and vehicles were exported to Mexico in 1913 to the value of \$352,683, as compared with \$307,080 in 1912. Electrical machinery, appliances and instruments constitute an important item in our ex-

ports, the shipments of this class of goods in 1913 being valued at \$1,998,282, as against \$1,913,567 in 1912.

Exports under the iron and steel schedule proper make an interesting exhibit and are tabulated by the bureau for the two fiscal years 1912 and 1913 as follows:

	1912	1913
Bar iron	\$38,654	\$57,121
Bars or rods of steel	69,672	75,586
Builders' hardware and tools	958,407	913,585
Castings, n. e. s.	137,614	75,379
Firearms	354,533	269,014
Machinery, machines, and parts of—		
Metal working machinery	46,977	83,259
Mining machinery	1,325,354	1,671,724
Pumps and pumping machinery	388,347	409,899
Sewing machines	533,152	712,655
Locomotives, steam	115,221	84,241
All other power engines and parts of	549,769	634,365
Typewriting machines	305,128	311,063
Woodworking machinery	196,571	94,621
All other	1,987,540	2,296,635
Nails and spikes	166,316	196,048
Pipes and fittings	1,590,381	2,295,857
Steel rails	893,758	551,576
Sheets and plates	929,153	827,001
Structural iron and steel	358,716	411,757
Wire	656,587	593,480
All other	3,066,998	2,925,714

Aside from the restoration of peace to stimulate our trade with Mexico, Government officials here are counting heavily upon the opening of the Panama Canal, which will no doubt result in the establishing of new steamship lines to Central and South America and in a material increase in the fleets of the existing lines. As much of this transportation will be competitive, the effect should be to reduce freight rates.

W. L. C.

### Pennsylvania Steel Company's Report

The report of the Pennsylvania Steel Company for the year ended December 31, 1913, shows total earnings to have been \$2,833,662 as compared with \$3,263,544 for the year previous, or a falling off of \$429,882. It should be noted, however, that there was an increase of \$700,000 over 1912 charged to expenses of operation and for ordinary and extraordinary improvements. In 1913 only one-half of the dividends paid in 1912 were disbursed, a decrease of \$514,020. The comparative income account of the company for the past two years is as follows:

	1914	1913
Income from operation	\$2,764,141*	\$3,113,818
Other income	69,520	149,725
Total earnings	\$2,833,662	\$3,263,544
Bond interest	1,017,341	1,053,923
Net income	\$1,816,320	\$2,209,620
Depreciation and sinking fund	1,186,676	1,159,532
Balance	\$629,644	\$1,050,088
Pref. dividend	514,020	1,028,040
	\$115,624	\$22,048
Miscellaneous adjustments	71,129†	1,138
Credit on railroad stock	959,709	—
	\$982,604	\$23,186
Previous surplus	4,732,903	4,710,716
Surplus Dec. 31	5,736,507	4,733,902

\*After operating expenses and allowance of \$3,500,000 for ordinary and extraordinary repairs, compared with \$2,800,000 similarly charged in 1912.

†Debit.

In his report to the stockholders, President Edgar C. Felton said:

"The coke-oven plant at Sparrows Point, one of the first of its type built in this country, which had been showing signs of giving out during the previous year, became radically worse in the spring of 1913 and had to be shut down finally during the last quarter of the year. The inefficiency of these coke ovens increased the cost of fuel used at Sparrows Point blast furnaces and resulted in high pig-iron costs. The earnings for the first half of the year were sufficient to warrant a dividend of 2½ per cent. on the preferred stock, which was paid on November 1. The earnings for the second half of the year, due to the above causes and to the marked

decline in business, were not sufficient to meet the dividend requirements for that period.

"The plan of improvements contemplates for the Sparrows Point works the building of new and improved coke ovens to take the place of those abandoned in 1913, the completion of the remodeling of the blast furnaces, which was begun in 1913, the addition of gas-blowing engines to the blast-furnace plant, together with important improvements to the Bessemer department and rolling mills and to the iron-ore handling equipment. At the Steelton works, the plan provides for the entire remodeling of the steel-making plant, the building of a combined structural and rail mill, extensive additions to the forge plant, improvements to the merchant rolling mills and a remodeling of the blast-furnace plant."

The 28-in. structural mill to be installed was originally part of the plant of Milliken Bros., Staten Island, was bought by the Bethlehem Steel Company, and afterward purchased from this company by the Pennsylvania Steel Company.

#### German Ferromanganese Costs

The cost of producing a ton of 80 per cent. ferromanganese and 20 per cent. spiegeleisen in the blast furnace in Germany is given as follows by the London Iron and Coal Trades Review, on the authority of Mine-Assessor Scheffer, writing in *Glueckauf*:

80 per cent. Ferromanganese	Tons	s. d.
Iron ore	0.270	10 10
Manganese ore	2.430	97 6
Coke	2.000	37 0
Lime	0.060	0 2
Working costs	—	12 0
Total		157 6
		(\$38.32)
20 per cent. Spiegeleisen	Tons	s. d.
Iron ore	1.526	38 10
Manganese ore	0.654	16 8
Coke	1.200	22 3
Lime	0.520	1 6
Working costs	—	9 0
Total		88 3
		(\$20.47)

Samuel L. Winternitz & Co., Chicago, are understood to have purchased the plant and equipment of the American Motor Company, Indianapolis, for approximately \$110,000, at the auction sale April 30, at which time this equipment was resold in parcels. It is reported that the aggregate selling price totaled \$220,000.

The physical laboratory of the National Electric Lamp Association, according to an announcement by Edward Hyde, director, will hereafter be known as the Nela Research Laboratory, National Lamp Works, General Electric Company, Nela Park, Cleveland, Ohio.

Alfred Marshall, president Marshall-Huschart Machinery Company, Chicago, has purchased the equipment and stock of the Universal Tractor Company, Newcastle, Ind., at receiver's sale for \$11,625. It is understood that the plant will be reopened.

The Allegheny Steel Company, Pittsburgh, maker of plates, sheets and boiler tubes, has removed its Chicago office to 332 South Michigan avenue. The company has also opened a new office in room 602 Pennsylvania Building, Philadelphia.

The number of employees at the Baldwin Locomotive Works, Philadelphia, is now 7800. On May 1, 1913, the number employed was 17,200. These figures indicate the effect of the industrial depression on labor.

The Allis-Chalmers Mfg. Company reports for the quarter ended March 31, 1914, total sales of \$2,791,383 and deficit after expenses \$65,698. Unfilled orders on hand were \$3,285,000.

The Iron City Foundry Company, Lebanon, Pa., has rebuilt its plant, replacing the old structure by a fire-proof shop 65 x 100 ft. Electric drive has been installed throughout.

#### Book Reviews

**Economics of Business.** By Norris A. Brisco, Ph.D., F.R.H.S. Pages XIV + 390, 5 x 7½ in. Published by the Macmillan Company, New York. Price, \$1.50.

In small space Dr. Brisco touches upon almost every phase of business methods and the instruments and machinery used in modern enterprises. The 24 chapters embrace information as to ancient and present ways of conducting business, organization, management, cost accounting, efficiency, buying, selling, advertising, money and credit, trademarks, copyrights, patents, etc. With so much covered, the author could not go deeply into any one subject, but the fundamental principles of each are epitomized. For those who wish to pursue any subject further numerous references are given. Self-instruction is assisted by questions pertaining to the contents of each chapter. The work is indexed and opposite each subject is a side head. Perhaps the author might have done better to have avoided the wholesale use of the word entrepreneur, in place of business manager or some of its variants. In seven pages, for instance, the French word appears 27 times.

**Investigating an Industry.** By William Kent, with an Introduction by Henry L. Gantt. Pages 126 + XL. Published by John Wiley & Sons, New York. Price, \$1.

This book, written in the form of a story, is an attempt to apply the principles of scientific management to the financial and selling end of a business. A firm whose mechanical equipment and shop methods are beyond reproach finds itself threatened with ruin because of probable competition. A physician who is also a "business doctor" is called in, and applies the fundamental methods of science to the problem in hand. He discovers that the difficulty lies in the cost of selling and that the remedy lies in increasing the efficiency of the sales department by giving them a larger variety of things to sell. He also points out that the spirit of scientific management should permeate the work of the financial and sales departments as well as that of the shop. He proposes a reorganization of the board of directors based on the general principle that this board has certain functions to perform, that these functions ought to be performed by committees of experts, just as the shop is administered by functional foremen. In order to secure experts to serve on these committees, the dummy directors resign and their places are taken by the responsible employees of the company, who are given an interest in the concern in order to qualify as directors.

The book is a very interesting one and highly suggestive. Its greatest value lies in the fact that it makes the reader think and so leads him to discover the truth for himself. It presents some of the problems of management from a new angle and ought to have the careful attention of any one responsible for the business administration of an industry.

"The Diesel Engine," a book recently issued by the Busch-Sulzer Bros.-Diesel Engine Company, St. Louis, is deserving of very careful consideration. The reading matter contained, in itself not only valuable but interestingly written, has been dignified by an unusual excellence of style and taste in the work of the printer and engraver. With liberal illustration, the book portrays representative Diesel installations in 24 States. Happily, the story is left largely to be told by the reproduced photographs and the brief and clearly printed descriptive matter is essentially a caption. Opening with a short historical review of the development of the Diesel engine and a sketch of the inventor, the book presents the characteristics of this type of power unit and its special fitness for various classes of service. In closing, substantiation is offered for many of the preceding statements in the form of extracts from the experience of those who have operated the Diesel engine. The editor adds, in the final pages, useful engineering data bearing upon many routing functions of the engine room and power house.

# The Machinery Markets

Of all the machinery markets New England alone reports a slight betterment, although it is with the reservation that business is not good and satisfactory activity is not expected to come this spring. In special lines business here and there is satisfactory, but in a broad way dullness prevails. New York is quiet, both as to inquiries and sales. All machinery lines are at low ebb in Cleveland, where foundries are operating about 50 per cent., although there is one bright spot in the Lake Shore Railroad asking for quotations on a dozen machines. Union carpenters went on strike in Cincinnati May 1, and teamsters are threatening to go out, which will hamper building plans in that place; meanwhile the machinery business is not encouraging, the dealers finding that most of the preference is for second-hand tools. Business in April was below normal in Detroit and the machine tool trade continues dull, although some lines of special machinery show an improvement. In Milwaukee the trade is disappointed over the failure of the market to show a greater recovery; absolute need still being the basis of buying. The demand is under normal in the central South. The machine tool market is apathetic in St. Louis, with no more interest being shown in second-hand equipment than in new machinery. In Birmingham a little more confidence is noted, but the only active buying is of small engines for farm use. Less anxiety is felt over the Mexican situation in Texas, and irrigation work is going ahead at a good rate. The demand is not great on the Pacific coast, but it is broadening out, and there is considerable buying of equipment for the lumbering and canning industries.

## New York

NEW YORK, May 6, 1914.

There are few inquiries and fewer sales in this locality and members of the trade are beginning to speculate rather anxiously as to when a change will come. All are of the opinion that an announcement by the Interstate Commerce Commission on the freight rate question will mean a turn for the better, whichever way the decision goes. Such sales as are coming to notice confirm the statement heretofore made that the scattered buyers of one or a few tools, used machines being preferred in some cases, are not those who are the usual support of the trade. The evidence all is that most metal working lines do not feel justified in replacing or adding to their equipment. Some makers of specialties, however, are busy, such, for example, as those who turn out cream separators, bottle and jar caps, silk machinery, etc. It is to similar manufacturers that the comparatively small sales are being made. Railroad buying cannot be said to be much improved, although the roads are showing a little better interest in specialties peculiar to their shops.

The Turner Construction Company, 11 Broadway, New York City, has been awarded the general contract for the construction of a new factory building by George Laub & Sons, manufacturers of sole leather, Buffalo, N. Y. The building is to be reinforced concrete throughout, 118 x 255 ft., five stories. Work will be undertaken at once.

Bids will be received until May 12 by C. G. Bruckert, clerk of the board of waterworks, Bruning, N. Y., for one deep well pump, motor driven, one 50-hp. oil engine, and one 35-kw., direct-current, 110 to 120 volt, three-wire-system generator.

The Central Hudson Gas & Electric Company, Rochester, N. Y., will install generators in its steam generating plant.

The General Railway Signal Company, Rochester, N. Y., has increased its capital stock from \$5,000,000 to \$10,000,000.

The board of water commissioners, Sea Breeze, N. Y., Arthur L. Case, chairman, is receiving bids until May 15 for the construction of waterworks system. H. C. Kittredge, German Insurance Building, Rochester, is the engineer.

The Erdle Perforating Company, Mill and Factory streets, Rochester, N. Y., manufacturer of sheet metal, is building a one-story, reinforced concrete factory, 60 x 300 ft., and will make minor additions in the near future. It will add other machinery, particularly of heavy type, to take care of an increasing variety of output.

The Lyons Business Men's Association, Lyons, N. Y., Charles M. Coffey, chairman, will build a cold storage plant having a daily capacity of 45,000 bbl. The cost will be about \$50,000.

The Consolidated Milling Company, Buffalo, has filed plans for a feed mill, grain elevator, dry house and car sheds, concrete construction; which it will erect at Prenatt street and the Nickel Plate Railroad, to cost about \$100,000.

The Buffalo Specialty Company, manufacturer of oil products, varnishes, etc., Buffalo, Oliver Cabana, Jr., president, will build an addition to its plant at Northland avenue and the New York Central Railroad Belt Line.

The city of Yonkers is having plans prepared for an incinerating plant to be built at an estimated cost of \$100,000. D. R. Dedrich, chairman building committee, care Statesman office, Main street, can be addressed.

The General Electric Company, Schenectady, will build a pumping station and sewage system at its plant to cost about \$100,000.

The Askell & Smith Company, Canajoharie, N. Y., has let the general contract for the erection of an addition to its factory to cost with equipment about \$20,000.

The Katterman Mitchell Company, Port Jervis, N. Y., is preparing plans for a two-story silk mill 125 x 300 ft., concrete construction, to be erected this spring. James A. Wylie is general manager.

The Brandow Printing Company, Albany, is taking bids for a printing plant 50 x 80 ft., one story, to be erected at once. A. S. Brandow, 16 State street, is president.

Architects Agne, Rushmer & Jennison, Utica, N. Y., are taking bids for a two-story and basement building 50 x 80 ft., to be erected in that city by the Consolidated Water Company. R. V. Sherman is president. The cost with equipment is estimated at \$50,000.

The Genesee Pure Food Company, Leroy, N. Y., is preparing plans for a power house which it will erect at an estimated cost of \$15,000.

The Reynolds-Schalon Foundry Company, Colonie, N. Y., will build a 35 x 75 ft. addition to its plant, to be used as a tumbling room and shipping department.

The Ellenville Electric Company, Ellenville, N. Y., is taking bids for a one-story addition to its plant.

The Rail Joint Company, Troy, N. Y., has increased its capital stock from \$500,000 to \$4,000,000.

Governor Glynn has signed the bill empowering the city of Watervliet, N. Y., to issue \$497,000 in bonds for the construction of waterworks.

The plant of the Wegman Piano Company, Auburn, N. Y., was burned May 1 with a loss of over \$100,000 on building and machinery. It is expected the plant will be rebuilt at once.

The town of Pompton Lakes, N. J., has approved a \$55,000 bond issue for waterworks. J. B. Rider, 26 Broadway, New York City, is the engineer.

The Webb Wire Works, manufacturer of music wire, etc., New Brunswick, N. J., will enlarge its present

power plant at an estimated cost of \$9000. The contract has been awarded.

The Waynesboro Metal & Foundry Company, Waynesboro, Pa., manufacturer of castings, etc., will probably install a traveling crane. C. M. Tritach is general manager.

The Bagby Furniture Company, Baltimore, Md., has awarded the contract for its new reinforced concrete factory to be built at an estimated cost of \$50,000.

## Chicago

CHICAGO, ILL., May 4, 1914.

The Watrous-Acme Mfg. Company, Chicago, has acquired a site for a manufacturing plant and warehouse in the central manufacturing district of Chicago, and will erect buildings at once for the manufacture of a line of builders' hardware.

The Utility Road & Farm Machinery Company, Chicago, has been incorporated with a capital of \$45,000 in the office of Thomas McEnerny, 30 North LaSalle street.

The Aurora Steel Tank Company, 33 West Illinois street, Chicago, is in the market for a second-hand gas engine of about 25 to 30 hp., suitable for operating on artificial gas and also a belt-driven duplex air compressor with cylinders about 6 x 8 in.

The DeLaunay Engine Company, of Chicago, in which Guy Guernsey, Hamilton Club, Chicago, has a considerable interest, is seeking a site at Joliet, Ill., upon which to build a plant for manufacturing the company's gas engine.

The Willys-Overland Company, Toledo, Ohio, has completed plans for the erection of a building at Armour avenue and Twenty-fourth street, Chicago, for the accommodation of that company's local business in Overland pleasure cars and Garford trucks.

The Garden City Can Company, Chicago, has been organized with a capital stock of \$10,000 to manufacture tinware and metal goods. The company can be addressed in care of Wm. A. Jennings, attorney, 69 West Washington street.

The Sanitary District of Chicago is about to expend \$20,000 in the enlargement of one of its sub-stations.

The Porcelain Enameling & Mfg. Company, Chicago, is having plans prepared for a one-story factory, 75 x 125 ft., to be erected at 100 Fifty-sixth avenue, at a cost of \$15,000. C. A. Eckstrom, 5 North LaSalle street, is the architect.

The Celfor Tool Company, Railway Exchange Building, Chicago, of which E. B. Clark is president, has increased its capital stock from \$150,000 to \$1,000,000. It will declare a stock dividend and also extend its lines of manufacture.

The National Carton Company, Joliet, Ill., suffered a loss estimated at \$18,000 as the result of a fire which seriously damaged its plant.

The Western Clock Company, LaSalle, Ill., is erecting a new building, 83 x 106 ft., of fireproof construction, which will permit an expansion of its manufacturing facilities.

The Detroit Pneumatic Tire Company, of which E. Warren Wilson is president, has closed a contract for 10 acres of land at Springfield, Ill., on which a factory is to be erected at once.

The Robinson Mfg. Company, Robinson, Ill., of which L. M. Smith is manager, is about to erect a plant for the manufacture of kitchen cabinets for which new equipment will be required.

The Line City Foundry Company, South Beloit, Ill., has been incorporated with a capital of \$8000 to engage in a general foundry business. The organizers are A. Balderson, George Bitzer and Daniel Broadhurst.

The Hall Mfg. Company, Monticello, Iowa, is about to erect an addition to its factory.

The Bettendorf Hydrogen-Oxygen Company, Bettendorf, Iowa, is building a brick factory at an estimated cost of \$50,000. Contracts for most of the machinery have been placed, and operations will start about June 1.

The Nebraska Blaugas Company, Omaha, Neb., has

tentative plans for the erection of a gas plant in Des Moines at an estimated cost of over \$100,000. L. I. Abbott is general manager.

F. L. Marsh, Canton, Minn., architect, has drawn plans for a building for M. C. Willford. A pneumatic pump is among the machinery specified.

The Cedar Falls Foundry Company, Cedar Falls, Iowa., is building an addition to its plant, 33 x 50 ft., which will double its capacity. This expansion has been necessitated by the demands of work already on the company's books.

The Beaver Dam Welding & Machine Company, Beaver Dam, Wis., has been organized by George Arndt and O. J. Hawley, who have leased a building and will operate a general machine shop with additional equipment for handling, welding and cutting metals.

J. F. Ulrich, Worthington, Minn., is building a one-story brick garage, 104 x 104 ft., at an estimated cost of \$10,000. Additional equipment will be purchased after the completion of the new structure.

The City Council, Duluth, Minn., has approved an estimate of \$36,500 for new work recommended by the present water and light department. The contemplated work includes the installation of an electric pump.

The Hutchinson Box Board & Paper Company, Hutchinson, Kan., manufacturer of straw boards, etc., is building an addition, 60 x 80 ft., one story.

At Larned, Kan., a bond issue of \$90,000 is under consideration as a means to provide funds for the construction of a municipal light and power plant.

The Brandt Mfg. Company, Hastings, Minn., a large part of whose plant was recently destroyed by fire with a loss of about \$60,000, will rebuild the damaged portion at once.

## New England

BOSTON, MASS., May 5, 1914.

Business is slightly better, but it is not good. As a rule, manufacturers and dealers do not anticipate any great improvement, though the spring trade, deferred by the unseasonable lateness of warm weather, should have a stimulating influence. Local industrial stocks are strong in the New England cities. Bank clearings are on the increase. May day has passed with very little labor trouble, as might be expected. In a few scattered instances textile mills are experiencing small strikes, but the total of workmen affected is trivial.

H. P. & E. Day, Inc., Seymour, Conn., manufacturers of fountain pens, will build an additional factory 30 x 100 ft., five stories, of reinforced concrete, and two smaller structures, one 20 x 35 ft., for a vulcanizing department, the other 22 x 40 ft., for an engine room.

The entire property of the Knox Automobile Company, Springfield, Mass., has been sold to Edward O. Sutton by the trustee in bankruptcy, Charles G. Gardner, and the sale has been approved by the referee in bankruptcy. The purchase price was \$631,000, of which the equipment including machinery totaled \$180,750. The sale is not wholly completed, however, for the creditors and stockholders will probably apply to the United States Court for a revocation of the adjudication, claiming the price received is too low.

The Cowan Truck Company, Holyoke, Mass., is to secure larger quarters for its factory, either by rental or by the erection of new works.

The Atwood Machine Company, Stonington, Conn., is building an addition to its works.

The Dana S. Courtney Bobbin Company, Willimantic, Mass., is preparing plans for a large addition to its works.

The Blake-Whitney Wire Company, Hamden, Conn., is erecting an addition to its works, 60 x 65 ft., one story.

A company is organizing in Putnam, Conn., to build a railroad between that place and Stafford Springs, a distance of 31 miles, and with a branch 12 miles long from Putnam to Chepatchet, R. I., to connect in a direct line with Providence, R. I. The road would give transportation to a number of small man-

ufacturing centers that now are isolated, especially in their freight accommodations. The purpose is to operate gasoline motor cars for all traffic, and with motors for freight capable of hauling trains.

Experience of the builders of the Cape Cod Canal demonstrates that the new waterway, which will be opened in the not far distant future, will be open for navigation all the year round. The work of the dredges and tugs proves, according to official statement, that ice does not form in sufficient thickness, even before salt water is pouring through the cut, to impede navigation for the class of vessels for which the canal is designed. The channel will be 100 ft. wide with a minimum depth of 20 ft. The resulting benefit to New England points north of Cape Cod should be enormous, for the risk of rounding the cape in inclement weather is large, and the time-saving is almost equally important.

## Cleveland

CLEVELAND, OHIO, May 4, 1914.

Business in practically all machinery lines continues at a low ebb. Few orders are coming out, except for single tools, and orders for these are below normal. April, as a whole, was the worst month experienced by dealers for a long time. The Lake Shore & Michigan Southern Railway is again asking for quotations on a dozen machines for its new Air Line Junction shops, this business having been held up a few months ago. Little change is apparent in the manufacturing situation. Manufacturers of automobile parts are continuing quite busy. The demand for boilers and steam engines is quiet. Considerable business is in prospect, but is held up. Foundries continue to run at about 50 per cent. capacity.

The New York Central Lines has sent out a new list of machinery requirements for the new Lake Shore shops at Air Line Junction near Toledo, some changes being made in the original list, which was sent out in January. The list is as follows:

One 24-in. motor-driven shaper.  
Two 36-in. high duty drill presses.  
Two 32-in. high duty drill presses.  
One 16-in. automatic cut-off saw.  
Three direct motor-driven double dry emery grinders.  
One 3-in. pipe cutting and threading machine.  
One combination punch and shear with 48-in. throat on shear and 36-in. shear on punch.

One journal turning lathe, to swing 51-in. wheels over bed and 45-in. over carriage, and to take 7 ft. 5 in. between centers.

The Vlcek Company, Cleveland, has placed contracts for the erection of its plant addition, which will be a two-story brick and concrete structure, 80 x 180 ft. This will add 50 per cent. to the present capacity. The company will be in the market shortly for equipment for the extension, which will consist entirely of forging machinery.

The Tinnerman Steel Range Company, Cleveland, will enlarge its plant by a three-story addition of semi-mill construction, 60 x 103 ft. No new machinery equipment will be required.

The Ford Motor Company, which has been considering the building of a service station in Cleveland for some time, has finally acquired a site at Euclid avenue and East 117th street, adjoining the Belt Line Railway. It is expected that the company will begin the erection of a large building on the site in the near future.

Bids have been received for a new plant to be erected in Warren, Ohio, by the Chicago-Cleveland Car Roofing Company. The plant will be 140 x 300 ft., of concrete and steel construction.

The Iddings Company has succeeded the Peerless Sifter Company, Warren, Ohio, and will manufacture stamped articles from tin plate and sheet steel, do a jobbing work in stamping and make dies for and develop various articles. E. L. Iddings is president; R. B. Wick, vice-president, and W. T. Iddings, secretary and treasurer.

The Frank E. Wilson Mfg. Company, Lancaster, Ohio, received bids May 4 for a factory building.

The Osborn Engineering Company, Cleveland, has received bids for two factory additions for the Fire-

stone Tire & Rubber Company, Akron, Ohio. Both will be five stories, of steel and concrete construction. One will be 180 x 400 ft. and the other 120 x 180 ft.

The American Militaire Cycle Company, Cleveland, has been incorporated with a capital stock of \$100,000 by M. L. Thomsen, and others, to manufacture motorcycles.

It is reported that the Pittsburgh Conveying Machine Company has purchased the plant of the East Liverpool Foundry & Machine Company, East Liverpool, Ohio, where it will establish its business in the near future.

John D. Owens & Son will shortly build a lime and sulphur plant at Owens station, Ohio, to replace one that was recently burned.

Plans for a sewage disposal plant for Canton, Ohio, have been completed by R. Winthrop Pratt, Hippodrome Building, Cleveland, and bids for its construction will be asked for shortly. Steps are under way for the erection of sewage disposal plants in New Philadelphia and Barberton.

The Braun-Hoff Electric Company, Canal Dover, Ohio, which will manufacture electric motors, generators, etc., has been incorporated with a capital stock of \$50,000 by William A. Braun, and others.

The city of Cleveland will receive bids May 13 for stokers, bunker and ash hoppers and heaters for the city hospital and laundry equipment for the correction farm. Bids for venturi meters for the water department will be received May 14.

The Enamel Products Company, Cleveland, will build a new plant, 80 x 260 ft., of brick, concrete and steel construction. Plans are being prepared by W. S. Ferguson, architect, Cleveland.

The Pennsylvania Lines has an inquiry out for a hammer and a shear, this inquiry supplementing a list recently sent out of machinery requirements for Indiana Harbor.

The Ohio State Board of Health has ordered the city of Xenia, Ohio, to build a sewage disposal plant at once. A bond issue of between \$25,000 and \$30,000 will be required.

## Detroit

DETROIT, MICH., May 4, 1914.

April business in the local machinery market was considerably below normal and the month was rather unsatisfactory to both dealers and manufacturers. The demand the past week has continued dull for standard tools, but there has been increased activity in some lines of special machinery. Inquiries are light and business closes slowly. The second-hand machinery market reflects general conditions and is dull. Some machine shops working on special orders are busy, while others are operating on part time. The foundry situation is unchanged, plants running at about 60 per cent. of capacity. Favorable weather has stimulated activity in building circles and a large amount of new construction work is being started.

The Standard Motor Truck Company, Detroit, has acquired a large factory site on Bellevue avenue near Kercheval avenue, improved with a two-story brick building. The new plant will afford the company facilities for adding to its equipment and increasing its output.

The Detroit Electric Welder Company, Detroit, has been incorporated with \$10,000 capital stock to manufacture electric devices and to operate a foundry and machine shop. Harry M. Lau is the principal stockholder.

The Gordon Chapman Company, Chicago, mattress manufacturer, will establish a large plant in Detroit.

The Michigan Paper Tube & Can Company, Detroit, has been incorporated with \$10,000 capital stock to manufacture paper containers and sheet metal stampings. The incorporators are Albert A. and Charles Schaefer and August Striwicki.

The Dorl-Wiley Top Company, Detroit, has been incorporated with \$25,000 capital stock to erect and equip a plant for the manufacture of automobile tops. Walter P. Dorl and Henry W. Wiley are the principal stockholders.

The Johnson Company, Detroit, has been incorporated with \$30,000 capital stock to manufacture automobile accessories. The incorporators are Walter R. and Chester T. Johnson and Irvin Long.

The Muskegon Pattern Works, Muskegon, Mich., has outgrown its present quarters and has acquired a new plant which will enable it to greatly increase its capacity. The Muskegon Paper Box Company will occupy a portion of the new factory.

The Hancock Mfg. Company, Charlotte, Mich., manufacturer of automobile accessories, is having plans prepared for an addition to its plant, 72 x 100 ft., two stories.

The Industrial Works, Bay City, Mich., manufacturer of cranes and railroad accessories, is now occupying the new buildings recently completed. A large amount of mechanical equipment has been added and the company's facilities have been greatly increased.

The American Malleable Company, Lancaster, Pa., will locate a branch plant at Owosso, Mich., and will erect a building to be utilized as a foundry in addition to occupying the buildings vacated by the Reliance Truck Company.

The Michigan Forest Products Company, Muskegon, Mich., has been incorporated with a capital stock of \$100,000 and will develop a large timber project in Chippewa County, Mich. John H. Moore and C. L. Lansberry are at the head of the new enterprise.

The Peter White Land Company, Marquette, Mich., will establish a large fruit canning plant in that city.

The McMullen Machinery Company, Grand Rapids, Mich., one of the largest machinery dealers in western Michigan, has increased its capital stock from \$15,000 to \$30,000 to provide for increasing business.

The Welch Mfg. Company, Sparta, Mich., manufacturer of store furniture, has broken ground for an addition to its plant, 30 x 196 ft., three stories. The company's general offices are at Grand Rapids.

A. E. Powell, Imlay City, Mich., manufacturer of special machinery and tools, will remove his plant to Lapeer, Mich.

The capital stock of the Alter Motor Car Company, Detroit, has been increased from \$10,000 to \$75,000.

The J. E. Bolles Iron & Wire Works, Detroit, has increased its capital stock from \$100,000 to \$150,000.

## Indianapolis

INDIANAPOLIS, IND., May 4, 1914.

The Tillman Heating Devices Company, Indianapolis, has been incorporated with \$50,000 capital stock, to manufacture heating systems. The directors are M. D. Tillman, H. A. Thrush and A. C. Houser.

The Auto Tire Corporation, Indianapolis, has been incorporated with \$25,000 capital stock to manufacture tires and automobile accessories. The directors are A. A. Clark, K. W. Gant and Walter Myers.

The O'Mullins Quick Adjustable Wrench Company, Terre Haute, Ind., has been incorporated with \$25,000 capital stock, to manufacture tools. The directors are Ollie O'Mullins, J. N. White and Herman Harms.

The Caswell-Runyan Company, Huntington, Ind., has begun the erection of an addition to its factory.

The H. Paul Prigg Company, Inc., Anderson, Ind., has been incorporated to manufacture cyclecars.

The Chicago Sewer Pipe Company, Brazil, Ind., has been organized with \$50,000 capital stock to manufacture sewer pipe. The company bought a plant already established there. The directors are L. H. Krieter, T. H. McFerrin and W. J. Gilbert.

The Great Western Canning Company's plant and the Delphi Engineering Company's plant, both at Delphi, Ind., were burned April 25. The latter company manufactured steam hoists. The loss was over \$125,000.

The Ft. Wayne Electric Company, Ft. Wayne, Ind., has plans prepared for an addition to its plant to cost \$400,000, according to estimates.

The board of public works, Ft. Wayne, Ind., will receive bids until noon, May 16, for constructing an addition to the municipal light plant.

The Majestic Furnace & Foundry Company,

Huntington, Ind., has increased its capital stock \$30,000.

The city of Connersville, Ind., is planning to enlarge and remodel its pumping system.

The Severson Electric Company, Elkhart, Ind., has been incorporated with \$10,000 capital stock to manufacture electrical equipment. The directors are L. J. Severson, M. E. Crow and J. B. Fitch.

The Iron Tank Elevator Company, Seymour, Ind., has dissolved. The Blish Milling Company, of the same city, manufacturer of flour, has increased its capital stock from \$30,000 to \$90,000.

The Weldum Products Company, Indianapolis, has been incorporated with \$10,000 capital stock, to manufacture welding and cutting machines. The directors are E. E. Davis, M. B. Hood and S. T. Deweis.

The Mutual Motor Service, Indianapolis, has been incorporated with \$10,000 capital stock to manufacture automobiles. The directors are C. P. Lenz, C. B. Glick and W. C. Rutherford.

## Milwaukee

MILWAUKEE, WIS., May 4, 1914.

The April business in general metal trades compares favorably with that of the corresponding period of 1913, in spite of predictions of a decided loss. The prospects for May, judging from the first few days, are not much better than a month ago, and disappointment is expressed over the failure of the expected improvement to set in. Tool builders report slightly improved business, due to necessary replacements by users who have been holding off until compelled to buy new machines. In other lines business is rather quiet, but inquiries are increasing. Absolute need seems to be the basis of all buying. There is no semblance of labor trouble, which usually comes to a head on May 1.

The A. E. White Machine Works, Eau Claire, Wis., is making plans for the construction of a shop building. It has recently taken over the former Reinhard shop and equipment, but is still crowded for room, due to several large contracts for die cast and other metal specialties. Lawrence G. McCann, Detroit, Mich., has joined A. E. White in the perfection of a device for setting small factory saws, which will be marketed when additional facilities can be provided.

The Standard Paper Company, Milwaukee, Wis., is planning a new factory building to be erected at an estimated cost of \$125,000.

The Milwaukee Cyclecar Company, 511 First avenue, Milwaukee, is negotiating for the location of its manufacturing plant at De Pere, Wis. The company is capitalized at \$50,000 and plans to build 3000 cars in 1914.

The Lipman Air Appliance Company, Beloit, Wis., has been organized with a capital of \$100,000 to engage in the manufacture of air compressors and portable pumps for garage use. The organizers of the company are Ernest Carle and E. K. Lipman.

The Mineral Point Public Service Company, Mineral Point, Wis., has purchased the property of the Dodgeville Electric Light & Power Company, and is entirely remodeling the power plant at Mineral Point. The latest coal and ash handling machinery will be installed and the engine room will be equipped with a 20-ton crane.

The citizens of Colfax, Wis., have voted \$14,000 bonds for a waterworks. A. F. Thompson, Chippewa Falls, Wis., is the engineer.

The Plymouth Foundry & Machine Company, Plymouth, Wis., manufacturer of ensilage cutters, carriers and blowers, will build a machine shop and foundry. Details as to the buildings have not been decided upon.

The power plant and mill owned and operated by the Bark River Electric Light & Power Company and the Rome Roller Mills Company, Rome, Wis., were destroyed by fire May 1 and will be rebuilt at once. The loss is \$25,000.

The Oneida Garage & Machine Company, Rhinelander, Wis., is remodeling for its own occupancy the old Pabst building, damaged by fire a short time ago. Some new equipment will be purchased.

The Carson-Rowell Company, Appleton, Wis., producer of babbitt metal, has awarded contracts for the construction of a plant, 36 x 90 ft., two story and basement, of steel and concrete, with a capacity of 5,000,000 lb. annually. The equipment will comprise 12 furnaces.

The Kaye Mfg. Company, Grand Rapids, Wis., has broken ground for a wood-working plant, 66 x 70 ft., to be operated by electric power throughout.

The Kaudy Mfg. Company's plant at Grand Rapids, Wis., which has been idle for nearly a year, is being renovated for a quick resumption of operations. Buildings are being remodeled and the plant will be changed to electric drive by individual motors throughout.

The Universal Oxygen Company, Sheboygan, Wis., has increased its capital stock from \$50,000 to \$125,000 to provide for extensions of the plant and operations.

The International Hoist Company, Antigo, Wis., manufacturer of gasoline engines and small hoisting rigs, is to be reorganized by J. C. Wright, of Antigo, who recently took over the mortgage. The proposition will be refinanced, and arrangements made for a large output.

The A. L. Trachte Company, Madison, Wis., incorporated with \$6000 capital, proposes to engage in the manufacture of steel and iron tanks and other sheet metal specialties. A. L. Trachte is president.

George Dargis, Iron River, Wis., who is erecting a fireproof garage, will need a small supply of machine shop equipment.

The Killen-Strait Mfg. Company, Appleton, Wis., which recently reorganized and incorporated for \$200,000, is preparing to build additions for tin and blacksmithing purposes. Considerable equipment is being purchased.

## Cincinnati

CINCINNATI, OHIO, May 4, 1914.

On May 1 the union carpenters in Cincinnati quit work, and it is currently reported that the teamsters are on the verge of walking out. While the unions mentioned could not tie up building operations entirely, there is a tendency to defer plans for plant additions. As a consequence, there is little manufacturing news in this immediate vicinity.

Reports from machine tool builders are not very encouraging. Several have received scattered domestic orders, but, with the exception of a few, it is now getting to be a serious problem to provide enough work to keep working forces intact. This means stocking up on standard sized machines, necessarily a costly proposition for the manufacturer. Dealers state that they are doing a fair business, most of which is in the smaller tools, with a preference shown for second-hand, rebuilt machines. This indicates that neither the railroads nor the automobile manufacturers are now doing any buying. Small electrical units are still in moderate demand. There is no improvement in the foundry situation; taken as a whole, the average of activity remains around 50 per cent. of capacity.

James Cullen, Race and Canal streets, Cincinnati, is organizing a company to erect an ice plant. A site has been secured in Corryville, a suburb.

The D. Gruen Sons Company, Cincinnati, watch maker, has secured an additional site adjoining its plant on McMillan avenue, and contemplates adding to its manufacturing facilities at an early date.

Work will be commenced at an early date on an addition to the plant of the Andrew Jergens Company, Cincinnati, estimated to cost \$100,000. Only special soap-making equipment will be required.

The Star Foundry Company, Covington, Ky., has commenced work on a molding room addition to its plant, recently mentioned as contemplated.

The Mosler Safe & Lock Company, Hamilton, Ohio, officially denies that it contemplates moving its plant, as has been reported by the daily press.

The city of Columbus, Ohio, has formally appropriated \$125,000 for increasing the capacity of its waterworks plant. At least one large pumping unit will be purchased at an early date.

The G. F. Brunt Tile Company, Columbus, Ohio, is the name of a new company that will remodel the plant of the Chaseland Pottery Company. Considerable new equipment will be needed.

Royal Wolfe is interested in a new company that has been formed at Lancaster, Ohio, and has purchased the Acme Foundry Company's plant. Equipment for making concrete blocks will be added at an early date.

The Buckeye Steel Castings Company, Columbus, Ohio, has purchased the quarry and crusher plant of the Springfield Coal & Ice Company, Osborn, Ohio, and will start operations at once. Nothing is known as to machinery requirements.

The municipality of Ft. Recovery, Ohio, will soon advertise for bids on two boilers for the waterworks plant.

## The Central South

LOUISVILLE, KY., May 4, 1914.

Although business continues to move along at less than the normal rate, a fair number of contracts are being closed, and a more optimistic feeling is making itself felt among the machinery houses. Boiler manufacturers seem to be in the worst shape. They report that while they have been figuring on a good many jobs, practically all contracts have been held up to await improvement in industrial conditions. The electrical equipment concerns are getting orders chiefly for lighting plants and other public utilities. Machine tools are in moderate demand, especially for automobile repair shops. An unusually large number of ice factories have been projected, though it is late in the season for this line.

The Universal Swing Joint & Machine Company, Louisville, has changed its name to the Universal Swing Joint Company, which has been incorporated with \$100,000 capital stock. John Bridges is the principal stockholder. The company will be in the market for a number of machine tools, including a turret lathe; other metal-working equipment, to be built according to its specifications, is to be purchased.

The American Oak Leather Company, Louisville, which is purchasing equipment for the electrification of its plant, may purchase used motors, though bids are being taken at present on new equipment only.

The Premium Gum Company, Jeffersonville, Ind., will equip a factory for the manufacture of chewing gum. Neely Reeder is president and general manager.

The C. Lee Cook Mfg. Company, Louisville, which makes metallic steam packing, is reported to be in the market for additional equipment, consisting chiefly of machine tools. Robert Baldwin is general manager.

J. Russell Gaines, county engineer, Louisville, Ky., is in charge of the purchase of two pressure oil distributors for the county.

The Standard Oil Company, Louisville, will purchase a 150-hp. boiler. The boiler-house at Louisville is to be enlarged, and the blacksmith shop will be improved by the installation of additional equipment.

E. P. Menefee & Son, Jackson, Ky., will purchase sawmill equipment.

George Tomlinson, Winchester, Ky., is building an addition to his woodworking plant, to be used for the manufacture of rims for automobile and wagon wheels. Woodworking equipment will be needed.

The town of Bromley, Ky., is taking bids on a waterworks plant of small size, the estimated cost of which is \$5000. George Pearce is town clerk.

The Star Milling Company, Clinton, Ky., the plant of which was recently burned, will rebuild. Its grain elevator will be of reinforced concrete construction, and will have a capacity of 75,000 bu. J. U. Kevil, Mayfield, Ky., is the owner.

The Farmers' Warehouse & Stock Company, Sturgis, Ky., is in the market for elevating equipment to be installed in its grain-handling plant.

The West Kentucky Coal Company, Sturgis, Ky., is planning the construction of a large tipple, for which conveying and other equipment will be needed.

The Bohon Company, Harrodsburg, Ky., manufac-

turer of buggies, harness, etc., plans to construct an addition to its factory, work to begin about July 1. Power and special machinery will be needed.

The Louisville & Nashville Railroad Company, with general offices in Louisville, will establish shops at Lexington, Ky., to cost \$40,000. W. A. McDowell, Lexington, general agent of the Lexington & Eastern branch of the road, is in charge.

The Moon Auto Company, Lexington, Ky., will install a lathe and drill, motor-driven, in its repair shop. A building is now in course of erection. Address B. B. Read, the president.

The Illinois Central Railroad is to erect a power plant at Memphis, Tenn., for use in connection with its shops. A. S. Baldwin, Chicago, is chief engineer.

The Diamond Ice Company, Knoxville, Tenn., has been incorporated with \$50,000 capital stock and will establish a plant with a capacity of 40 tons a day. A cold storage plant may also be equipped. D. H. Williams is president.

The Maples Lumber Company, Knoxville, Tenn., is constructing a planing-mill building, and will be in the market for the necessary woodworking machinery.

The Henry County Automobile Company, Paris, Tenn., has plans for the construction of a garage. A repair shop will be operated in connection with it.

The Columbia Produce Company, Columbia, Tenn., will erect a cold storage plant. Bids on the building will be taken about June 1.

The Pence Lumber Company, Dyersburg, Tenn., whose sawmill was recently burned, has announced that the new plant will have double the former capacity.

The G. E. MacKenny Trunk Company, Chattanooga, Tenn., is considering the enlargement of its factory.

The furniture factory of Hugh Ledford, Tullahoma, Tenn., was recently burned with \$63,000 loss. It is planned to rebuild.

The M. P. Thompson & Son Mfg. Company, Harriman, Tenn., is to establish a large factory for the manufacture of pants and overalls. Power apparatus and sewing machines will be needed.

The Nashville Cold Storage & Ice Company, Nashville, Tenn., has been organized with \$675,000 capital stock. Edgar Ziylan, New York City, is among those interested. A plant with a daily capacity of 150 tons and a cold storage plant will be constructed.

The town of Cooper Hill, Tenn., will construct a municipal water system. Bids are now in the hands of the mayor.

R. C. Huston, Memphis, Tenn., is designing a water plant for Maryville, Tenn. The estimated cost is \$50,000.

Andrew Johnson, Morristown, Tenn., is reported to be in the market for equipment for the manufacture of brick.

The Memphis Cotton Mfg. Company, Memphis, Tenn., is planning the construction of a plant for the manufacture of cellulose and for bleaching linters. John P. Bullington, Central Bank Building, Memphis, may be addressed.

## Birmingham

BIRMINGHAM, ALA., May 4, 1914.

Small engines for farm purposes are in good demand and factories report an excellent demand for cotton gins. In other respects the machinery and machine tool trades are behind this time last year. Slightly greater confidence and more inquiry are reported, but buying has not increased.

W. M. Hood, Leeds, Ala., and others, have been granted a franchise and will construct an electric lighting system.

The J. B. McCrary Company, Atlanta, Ga., has been employed by the city of Ozark, Ala., to draw plans for a waterworks and electric lighting system for which \$25,000 of bonds was voted.

The city of Atmore, Ala., will issue \$20,000 of bonds for the establishment of a waterworks system.

The Guard Box Company, Mobile, Ala., of which J. H. Sheip is president, will rebuild its burned plant, including the sawmill, at a cost of \$150,000.

The United Gas & Electric Corporation, 40 Wall

street, New York City, will improve the gas plant at Birmingham at a cost of \$60,000. R. J. Titel is the engineer.

The Douglass Excelsior Company, Douglass, Ga., has been incorporated by C. E. Baker, C. P. Matthews and others, who propose to establish a factory.

A. R. Stevens & Bro., Tampa, Fla., will establish a plant at Orlando, Fla., for the manufacture of packing house equipment.

The Meredith-Noble Phosphate Company, Jacksonville, Fla., has been incorporated with a capital stock of \$250,000 by G. H. Noble, Somerville, N. J.; J. F. Meredith, Fort Myers, Fla., and others.

The Johnson & Johnson Company, Raleigh, N. C., will establish a brick plant to cost \$100,000. It will be electrically driven.

The Forsyth Furniture Company, Winston-Salem, N. C., will erect a three-story factory, 61 x 208 ft., at an estimated cost of \$10,000. It will be equipped with individual motor drive for which the motors are yet to be purchased.

The Greenville Iron Works, Greenville, S. C., founder and machinist, has been incorporated. It has leased a plant and will do general contracting work in these lines.

The Georgia Veneer & Package Company, Brunswick, Ga., will double the capacity of its main factory.

## St. Louis

ST. LOUIS, Mo., May 4, 1914.

The apathetic condition of the machine tool market has not improved and dealers have no increase in inquiries or any indications of a change in the present situation. They are, nevertheless, hopeful that it will come shortly. Present enterprises are cautious, while new concerns are holding up on their plans until assured that the depression has ended. There is some movement of machine tools, of course, but the volume is not great. There is no demand for equipment except for immediate and imperative needs. Second-hand machinery shows no life whatever.

Clarence W. Schnelle, trustee, St. Louis, has completed arrangements for the immediate construction of a plant for the manufacture of electrical appliances, the building alone to cost \$65,000.

A large plant for the manufacture of special candies for the wholesale trade will be equipped in St. Louis by the Package Confectionery Company, Boston, Mass., recently incorporated with a capital stock of \$2,000,000. It is to be one of several branch plants.

The Boston Machine Works Company, Boston, Mass., has leased quarters in the Leather Trades Building, St. Louis, and will operate there a branch house for the manufacture of shoe making machinery.

The Peter Heibel & Sons Planing Mill & Mfg. Company, St. Louis, has made a second purchase of land upon which to build an addition to its box mill.

The Safety Appliance Company, St. Louis, has been incorporated with a capital stock of \$40,000 by Frank Carter, and others, to manufacture safety appliances for elevators.

The F. E. Schoenberg Mfg. Company, 2014 DeKalb street, St. Louis, will equip a factory to make moldings and screens.

The city of Dexter, Mo., will receive bids until May 18 for the equipment of a water works plant, including pumping and power plant, etc. Webb Watkins is mayor.

The General Equipment Corporation, St. Louis, Mo., has been incorporated with a capital stock of \$21,000 by C. Y. Carr, M. B. Wallace and C. R. Scudder to do a general machinery and implement business.

The St. Joseph Ice & Mfg. Company, St. Joseph, Mo., has begun the construction of a \$25,000 building which will be equipped for ice manufacture, etc.

The Malleable Iron Foundry, Kansas City, Mo., will equip an addition to its present plant, the building to be 70 x 200 ft.

The city of Hunnewell, Mo., will spend about \$5000 on the equipment of an electric light and power plant. The mayor should be addressed.

The Hayti Light Company, Hayti, Mo., of which A. B. Cortright is general manager, will add a unit to its present plant involving about \$5000 for equipment.

The city of Gilman City, Mo., will expend about \$8000 in equipping an electric light plant. The work is in charge of E. B. Murray and L. C. Hamilton, Missouri Savings Bank Building, Kansas City, Mo.

The Interstate Brick Company, Liberal, Mo., has been incorporated with a capital stock of \$25,000 by S. C. Mellor, C. P. J. Bryant and G. C. Stephens and will equip a plant.

The Western Window Fixture Company, Kansas City, Mo., has been incorporated with a capital stock of \$50,000 by J. C. Fritzlen, R. B. Orr and B. T. Spencer.

The city of Butler, Mo., has completed plans for the equipment of a water works plant to cost about \$75,000. The mayor should be addressed.

The Adair Lumber Company, Kirksville, Mo., has increased its capital stock from \$100,000 to \$200,000 and will add to its mill equipment.

The sawmill of the Campbell Lumber Company, Kennett, Mo., was burned April 30 with a loss of \$50,000. It will be replaced at once with a mill of 75,000 ft. of hardwood daily capacity.

The Tiller Lumber Company, Bloomfield, Mo., has increased its capital stock from \$6000 to \$20,000 for the purpose of adding to its mill equipment.

The Alloy Metal Foundry Company, Belleville, Ill., has been incorporated with a capital stock of \$12,500 by W. G. E. Rolaf, Henry Rois, Hubert Hartmann, Jr., and Ernest E. Wangelin, and will equip a specialty foundry.

The St. Louis Cotton Compress Company, Little Rock, Ark., with offices in St. Louis, Mo., has issued \$300,000 bonds for the extension of its equipment and plants.

The Pine Bluff Cotton Compress & Warehouse Company, Pine Bluff, Ark., will expend about \$75,000 in adding equipment to enable it to handle 150,000 bales during the next cotton season.

The Coal & Gas Belt Electric Company, Huntington, Ark., of which G. W. Skow is manager, will install a 350-kw. turbine, 350-hp. boiler and a 10-ton ice plant.

The Harrison Ice & Storage Company, Harrison, Ark., of which R. M. Fellows, owner, will equip a 25-ton ice plant, expending about \$25,000 for equipment and accessories.

The Penrod-Jordan-McCowan Lumber Company, Devalls Bluff, Ark., will rebuild and re-equip the saw mill recently reported burned with a loss of about \$25,000 on equipment.

A company with \$25,000 capital has been formed at Pine Bluff, Ark., by J. P. Gracie, Rob Roy, Ark., and E. P. Bloom, Pine Bluff, and will equip a plant for the manufacture of patented metal harness breeching. B. R. Williams, English, Ark., is also interested.

The Little Rock Auto Garage Company, Little Rock, Ark., has begun the reconstruction of its recently burned garage and will install motors, lathes, presses, etc. The Union Trust Company will receive proposals.

A plant for the manufacture of materials for the construction of chairs will be equipped at Benton, Ark., by T. Manning, Womble, Ark., who is in the market for wood working machinery.

A finishing stave plant will be equipped at East Sylamore, Ark., by the Chess & Wymond Company, Louisville, Ky.

The city of Henryetta, Okla., will receive bids for machinery for its water works plant, including one 750-gal.-per-min. compound duplex steam pump, one 100-hp. boiler feed water heater, boiler feed pump, etc. The Benham Engineering Company, Oklahoma City, Okla., is in charge.

The city of Morris, Okla., has authorized the expenditure of \$42,000 for a water works. The Benham Engineering Company, Oklahoma City, Okla., is the engineer.

A waterworks plant to cost \$25,000 will be installed at Boswell, Okla. The mayor is in charge.

The Drumright Ice & Light Company, Tulsa, Okla., has been incorporated with a capital stock of \$30,000

by Chas. W. Shobe, Chas. F. Petty and Orville Knight, of Kiefer, Okla., to operate electric light and ice manufacturing plants.

The town of Percy, Okla., has voted \$25,000 of the bonds for the construction of a water system. J. G. Cronin is the engineer.

The Capital Ice & Storage Company, Oklahoma City, Okla., recently reported incorporated with a capital stock of \$110,000 by J. P. O'Leary, G. A. Morris, and others, has bought a plant and will remodel at an estimated cost of \$30,000.

The Healdton Operative Company, Anadarko, Okla., has been incorporated with a capital stock of \$330,000 by R. M. Davis, A. B. Elliot and L. L. Paterson, of Arapahoe, Okla., and will install and operate ice plants, etc.

The Stewart Sash, Door & Blind Company's plant at Gulfport, Miss., has been burned with a loss of about \$50,000. It will be replaced at once.

The board of trustees of the waterworks, New Iberia, La., is in the market for equipment for an extension to the plant. J. P. Suberbelle is purchasing agent.

The sewerage and water board, New Orleans, La., is receiving bids for a crane and other special equipment.

The Cooper Lumber Company, Alexandria, La., of which James Cooper is president, is to install a band, shingle and lath mill.

The Miller-Goll Mfg. Company, New Orleans, La., has increased its capital stock to \$50,000, and is reported in the market for wood working machinery.

Announcement is made that the machine shops of the Morgan Steamship Company, Algiers, La., are to be enlarged.

The Automobile Trading Company, New Orleans, La., has been incorporated with a capital stock of \$50,000, and will, it is announced, install a complete repair and rebuilding plant.

The Coquille Film Company, New Orleans, La., has been incorporated with a capital stock of \$50,000 and will manufacture moving picture films.

The New Orleans Industrial Alcohol Company, New Orleans, La., of which J. C. Eggart is president, will issue \$150,000 of bonds for the purchase of a complete distillery, including power plant, etc., with a capacity of 2,000,000 gal. per year. The capital stock is \$250,000.

The Winnfield Lumber Company, Winnfield, La., has been incorporated with a capital stock of \$100,000 to operate saw mills, etc.

The Delta Cement Tile Company, Greenville, Miss., has been incorporated with a capital stock of \$50,000 by J. P. Gooch, Jr., and others, and will equip a plant for the manufacture of concrete products.

## Texas

AUSTIN, TEXAS, May 2, 1914.

The machinery and tool trade has been slack on account of bad weather conditions. In southern Texas the excitement over the situation in Mexico has subsided and plans for constructing irrigation plants, cotton gins and other industrial enterprises will now be proceeded with.

The Houston harbor board, of which Jesse H. Jones is chairman, will soon adopt plans for developing terminals at the turning basin of the Houston ship channel. J. F. Coleman, engineer, has submitted tentative plans including 1,000,000 sq. ft. of storage and warehouse space, about 4300 ft. of docks, several miles of railroad and switching yards, a coaling station, waterworks, electric power plant and other equipment.

J. E. Hodgson, Llano, has purchased the cotton gin of the Farmers' Union Warehouse Company and will equip it with new machinery.

Otto Tefs, Brenham, will erect a cotton gin.

Plans have been completed by the Taylor Gas Company, Taylor, for a gas plant. C. F. Green is manager.

C. E. Baudsch, San Antonio, has practically completed arrangements for the construction of a brick plant with a capacity of 100,000 brick daily.

The Mission Land Improvement Company, Mission, is building five irrigation canals and will install pumping machinery.

The Crystal Ice Company, Sulphur Springs, is installing machinery and equipment for a cold storage plant costing about \$40,000.

The West Texas Lumber Company, San Angelo, will establish a factory to manufacture staves. B. B. Hall is president.

The town of Franklin, Texas, has voted \$17,500 of bonds for a municipal electric light plant and water works.

The O. K. Harry Steel Works, Dallas, Texas, has been incorporated and will continue its previous line, under the same name. It is intended to establish additional lines, such as steel silos, etc.

G. W. Hill, Trenton, is rebuilding his cotton gin recently destroyed by fire. An engine, boiler and four 80-saw gin stands will be installed.

The State Attorney General has approved the bond issue of the city of Sherman, including \$40,000 water works bonds. Extensive improvements will be made to the waterworks, etc.

The Nona Mills Company, Kountze, is contemplating the erection of a large canning factory. Harvey Gilbert is in charge.

Bids will soon be received by the city commissioners, Galveston, for the construction of water and sewer improvements costing about \$150,000.

Albert B. Fall, Three Rivers, N. M., and associates, will construct two large systems of irrigation for the purpose of reclaiming about 22,000 acres of land. The cost of the canal systems and pumping plants will be about \$135,000.

## The Pacific Coast

SEATTLE, WASH., April 28, 1914.

Some encouraging features are noted in the machinery trade and the demand is gradually broadening. The market for metal working tools here is of little importance as compared with the East, and the current movement is limited; but purchases of sawmill and logging equipment are keeping up in good shape, doing about as well as at any time in recent years. There is also some inquiry for heavy hoisting equipment, and harbor improvements at various ports are causing a pretty steady demand in several lines. Plans are under way for several power development projects, though there is no great activity in this line at present. The rapid agricultural development of the north Pacific States is causing quite an active demand for certain lines of small equipment, especially cannery, dairy and refrigerating supplies. Grain crops are in fine shape, with indications of a large movement of harvesting implements.

A. Gream & Son, Pasco, Wash., whose machine shop was burned April 13, announce that they will rebuild.

The port of Seattle commission will receive bids May 20 for machinery and equipment for the new Smith Cove pier, including a 5-ton gantry crane with a craneway of 185 ft. and a locomotive crane.

The Food Products Company, Seattle, plans to build a new evaporating plant at Wenatchee, Wash.

John A. Barker, Jr., North Yakima, Wash., is arranging for the construction of a large cold storage plant.

Bids received last year for an ice and cold storage plant at Pearl Harbor, T. H., have been rejected and new plans will be drawn.

The Okanogan Valley Power Company, Conconully, Wash., plans the complete rehabilitation of its power plant near Pateros. A large waterwheel is to be installed and other improvements made.

The factory of the Pacific Glass Works, Seattle, was completely destroyed by fire with a loss of about \$40,000. It plans to rebuild at once.

The Wilkeson Light, Power & Fuel Company, Seattle, Wash., has been incorporated with a capital stock of \$500,000. F. L. Van Nice, J. L. Teig and T. M. Tennent are the incorporators.

The Carlisle-Pennell Lumber Company, Chehalis,

Wash., is planning the construction of a sawmill. It will have a capacity of 100,000 ft. daily. A little later on it plans the erection of another mill of the same capacity.

The Consumers Brewing Company, Billings, Mont., of which J. Collins West is president, plans the erection of a \$150,000 brewery. Modern machinery will be installed, and the construction will be rushed.

The Cascade Creamery Company, North Yakima, Wash., according to statement made by S. J. Simonson, the manager, will erect a cold storage plant to cost about \$15,000.

The Frank K. Baker Lumber Company, Everett, has been incorporated by Frank K. Baker, J. E. Horna, and others. It plans the erection of a sawmill.

The shingle mill of the Burpee Lumber & Shingle Company, Anacortes, Wash., was recently destroyed by fire, causing a loss of \$20,000. It is reported the mill will be rebuilt at once.

J. G. Stephenson, manager the Oakridge Lumber Company, Oakridge, Ore., states that it plans the immediate erection of a sawmill.

The town clerk, Cashmere, Wash., will receive bids until May 11 for furnishing three-stage vertical centrifugal pumps, vertical type 30-hp. motor and a centrifugal pump.

The Chappel-Perkins Belting Company, Seattle, Wash., tanner, is building a belt manufacturing plant at 4758 Ballard avenue, Seattle, and not C. Perkins, as has been stated elsewhere.

The Walla Walla River Power Company, Salem, Ore., recently filed articles of incorporation, with a capitalization of \$120,000. It plans the erection of a power plant.

The Fossil Electric Light Company, Fossil, Ore., formerly owned by August Ilse, has been taken over by M. Dittmer, Spokane, Wash. The plant is valued at \$40,000. It is stated the new owner plans extensive improvements and additions to increase its capacity.

The Springfield Provision Company, Springfield, Ore., will construct a large packing plant.

The city engineer, Baker, Mont., is preparing plans and estimates for a waterworks.

The Northwestern Improvement Company, Red Lodge, Mont., is having estimates prepared for the establishment of a central heating plant.

The Reed Point Trading Company, Reed Point, Mont., is having plans prepared for the erection of a 30,000-bu. elevator.

The city of Kamiah, Idaho, recently sold bonds to cover the purchase of the present water system. It will be improved and extended.

Bids will soon be asked by the city clerk, Porterville, Cal., for furnishing and installing a pumping plant for the municipal water system.

J. E. Law and W. F. Johnson, Los Angeles, Cal., have purchased 31,000 acres of land and will install pumping plants to irrigate it.

Childs & Dexter, Emeryville, Cal., are building a plant for the manufacture of paper specialties.

The Ashlock Door & Window Guard Company, Santa Rosa, Cal., is building a factory. E. G. Rohrman is president.

## Eastern Canada

TORONTO, ONT., May 4, 1914.

The Turner Construction Company, 11 Broadway, New York City, has been awarded the contract for the construction of a two-story reinforced concrete factory, 100 x 200 ft., at Bridgeburg, Ont., for the Tuttle & Bailey Mfg. Company, 76 Madison avenue, New York City. Operations will start at once.

The Steel Trough & Machine Company, Ltd., Tweed, Ont., has raised its capital stock from \$25,000 to \$100,000.

The Hall Zryd Foundry Company, Ltd., Grimsby, Ont., has increased its capital stock from \$75,000 to \$250,000.

The Walker Foundry, Belleville, Ont., has been partly destroyed by fire. Messrs. McCarthy & Wright are the owners.

The Niagara Grain & Feeds, Ltd., Toronto, recently

incorporated with a capital stock of \$100,000, is erecting a grain elevator and feed mill at Port Colborne, Ont., with a capacity of 50,000 bu. It will have a full equipment of handling machinery, etc. S. H. Pitts is manager.

The Benjamin Wheel Company, Ltd., Yarker, Ont., has been incorporated with a capital stock of \$150,000 by R. H. Parmenter, A. J. Thomson, W. S. Morlock, and others, to manufacture wagons, machinery, implements, etc.

The United Drug Company will erect a factory at Toronto, containing 2 1/4 acres of floor space, to cost approximately \$250,000. It will supply the United Drug Company's Canadian business.

The Dominion Office Supply Company, Ltd., Walkerville, Ont., has been incorporated with a capital stock of \$25,000 by G. G. Kuhlmann, F. C. Ledyard, and others.

The Accounting & Tabulating Corporation, Ltd., Montreal, has been incorporated with capital stock of \$4,500,000 by Lawrence Macfarlane, C. A. Pope, George Barclay, and others, to manufacture perforating and tabulating machines, etc.

The Canadian Fleischer Gas Company, Ltd., Toronto, has been incorporated with a capital stock of \$40,000 by R. R. Bruce, J. L. Counsell, and others, to manufacture gas-making machinery.

The Multipress Company, Ltd., Toronto, has been incorporated with a capital stock of \$60,000 by S. D. Biggar, F. F. Treleaven, and others, to manufacture duplicating devices, typewriters, etc.

The Canadian Expansion Bolt Company, Ltd., Toronto, has been incorporated with a capital stock of \$40,000 by Edward W. Wright, G. P. Robinson, L. R. Zifferer, and others, to manufacture expansion bolts and appliances.

The Favary Tire Company, Ltd., Toronto, has been incorporated with a capital stock of \$500,000 by Frederick Kitching, D. H. Arnott, R. J. Young, and others, to manufacture tires, etc.

Johnson & Ross, Ltd., Toronto, has been incorporated with a capital stock of \$40,000 by F. W. Johnson, R. P. Ross, H. D. Burnett, and others, to manufacture scientific apparatus, surgical instruments, etc.

The General Vending Machines, Ltd., Windsor, Ont., has been incorporated with a capital stock of \$25,000 by G. J. P. Jacques, A. J. Janisse, and others.

The Wentworth Motors, Ltd., Hamilton, Ont., has been incorporated with a capital stock of \$40,000 by D. B. Wood, C. W. Heming, A. T. Heming, and others, to manufacture motor cars and trucks.

Bids are being received by the board of water commissioners, Tottenham, Ont., for pumping engines, etc., the waterworks system. James, Louden & Hertzberg, East Toronto, Ont., are the engineers.

Plans have been completed for an elevator and milling plant to be built at Port Colborne, Ont., by the Niagara Grain & Feed Company to cost about \$200,000.

## Western Canada

WINNIPEG, MAN., May 1, 1914.

The Leitch Brothers Milling Company, Regina, Sask., will erect a mill with a capacity of 3000 bbl. per day, and an auxiliary plant for sack making, etc.

The Metal Shingle & Siding Company of Canada, Regina, Sask., will erect a branch factory. W. R. McKenzie has been appointed factory manager.

The Northern Electric Company, Montreal, Que., will erect a factory at Regina, Sask.

The Interior Hardwood Finishing Company, Ltd., has secured a seven-acre site at Duncan, Vancouver Island, B. C., on which it will erect a large factory. Polishes, stains and toys are some of the articles to be manufactured and a special department will be devoted to the manufacture of separators.

The Western Tire & Rubber Company, Ltd., Regina, Sask., has been incorporated with a capital stock of \$1,000,000, and will erect a two-story factory 70 x 100 ft., to cost \$175,000. It will have a capacity of 200 to 300 tires per day, etc.

The Alberta Co-Operative Elevator Company, East

Calgary, Alta., will build a 30,000-bu. elevator. O. H. Olson, Volga, N. D., is contemplating the erection of a flour mill at Melfort, Sask., to have a capacity of 250 bbl. per day.

The Tisdale Trading & Milling Company, Tisdale, Sask., is having plans prepared for the erection of a 300-bbl. flour mill.

Tenders have been called for the new Government elevator to be erected at Calgary, Alta., which are to be in by June 1, 1914. The elevator will have a capacity of 2,500,000 bu.

Edmonton, Alta., will construct a filtration plant to be situated near the present power plant, to cost \$175,000. Commissioner Chalmers, who is in charge, announced that work would start immediately. The capacity of the plant will be 5,000,000 gal.

Tenders addressed to F. Dobbs, secretary-treasurer, Shoal Lake, Man., will be received until May 28, for equipment specified as follows: Contract 1, furnishing and installing semi-Diesel oil engine, and contract 2, furnishing and installing direct-current generator, booster and switchboard. Plans and specifications may be seen at the offices of the John Galt Engineering Company, Ltd., Winnipeg, Man., and Calgary, Alta., or at the town hall, Shoal Lake, Man.

It is announced that Stewart, Moore & Wright, Vancouver, B. C., are contemplating the erection of a large iron and steel plant at New Westminster, B. C. It is understood that the Dominion Elevator Equipment Company and the Llewellyn Iron Works, Vancouver, B. C., are interested.

The plant of the Alberta Lumber Company, Vancouver, B. C., which was recently destroyed by fire, entailing the loss of \$100,000, will be rebuilt.

The Hunting-American Lumber Company, Eburne, Point Grey, B. C., will construct a large lumber mill.

## Government Purchases

WASHINGTON, D. C., May 4, 1914.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until May 26, schedule 6724, for one portable compression yoke riveter for Boston; schedule 6725, for one back-geared screw cutting lathe, one 24-in. upright drill and one milling machine with overhanging arm, all motor-driven, with variable speed, for Brooklyn; schedule 6741, for ten portable hand tachometers for Brooklyn; until June 2, schedule 6759, for three 1000-lb. and six 2000-lb. worm-geared chain blocks for Puget Sound; schedule 6764, for two motor-driven direct-connected 10-in. suction fuel oil centrifugal pumping units for Boston; schedule 6765, for one fire pump complete for Key West; schedule 6766, for two 52-in. turning and boring lathes for Washington; schedule 6767, for two 26-in. upright sliding head drills, two 5-hp. vertical self-contained steam engines, two heavy duty back-geared belt-driven screw cutting engine lathes with 20-in. x 12-ft. bed, two tool grinding machines and two 16-in. back-geared crank shapers for Norfolk.

Bids will be received at the office of the light house inspector, third district, Tompkinsville, N. Y., until 3 p. m., May 14, for one engine-driven air compressing plant.

Bids will be received by the U. S. Reclamation Service, 605 Federal Building, Los Angeles, Cal., until May 11, for furnishing hydraulic apparatus for the Okanogan project, Wash.; until May 21, for furnishing two six-second ft. horizontal centrifugal pumps, equipped with foot valves and gate valves. O. H. Ensign, chief electrical engineer, is in charge.

Bids were received at the Bureau of Supplies and Accounts, Navy Department, Washington, on April 28, for the following supplies for the navy yards:

Schedule 6570, Steam Engineering.  
Class 54, Portsmouth, Boston and Brooklyn—Motor generator testing sets—Bid 34, \$1118; 128, \$1170.  
Class 55, Mare Island and Puget Sound—Seven motor generator testing sets—Bid 34, \$623; 128, \$647.50.

Schedule 6604, Ordnance.  
Class 71, Washington—Triple-geared engine lathe—Bid 135, \$4574, \$4836, \$4595 and \$4436; 142, \$4662, \$4582 and \$4417; 188, \$3985, \$3875 and \$3815; 204, \$4680, \$4605, \$4480 and \$4405.

## Schedule 6605, Construction and Repair.

Class 61, Norfolk—One spinning, burnishing and trimming lathe—Bid 16, \$930 and \$1000; 142, \$925 and \$887; 189, \$924 and \$924; 202, \$924 and \$994; 267, \$1030.

## Schedule 6607, Steam Engineering.

Class 32, Norfolk—Two pipe and nipple machines, motor driven—Bid \$2, \$492; 39, \$489; 141, \$545.45; 142, \$499.50 and \$104; 189, \$390.

## Schedule 6616, Ordnance.

Class 131, Washington—48 spur-gear chain hoists—Bid 64, \$2325; 69, \$1461.76; 88, \$544, part; 114, \$1625.28; 120, informal; 184, \$1280.64; 200, \$1881.12; 205, \$1630.88.

The names of the bidders and the number under which they are designated in the above list are as follows:

- 16. E. W. Bliss Company.
- 34. James G. Biddle.
- 39. A. J. Cropp & Co.
- 64. Chisholm & Moore Mfg. Company.
- 69. de Zouche, Hanson & Co.
- 82. Fairbanks Company.
- 88. George S. Fowler.
- 114. Charles H. Graff.
- 120. Louis Hartig.
- 128. Holtzer-Cabot Electric Company.
- 135. J. H. Johnson, Jr., Company.
- 141. Knickerbocker Supply Company.
- 142. Kemp Machinery Company.
- 184. Manhattan Supply Company.
- 188. Manning, Maxwell & Moore.
- 189. Michigan Wire Cloth Company.
- 200. New Jersey Foundry & Machine Company.
- 202. D. Nast Machinery Company.
- 204. Niles-Bement-Pond Company.
- 205. National Electrical Supply Company.
- 267. E. H. Stoll Company.

Bids were received by the U. S. Reclamation Service, for marine gas engine for the Yuma project, Ariz., on April 13, under advertisement 285, as follows:

Item one, price, time, and point of delivery; one-A, price, time, and point of delivery.

Wisconsin Motor Mfg. Company, Milwaukee, \$598 and \$865, Milwaukee, about two or three weeks.

Brennan Motor Company, Syracuse, item one, \$690, Syracuse, about seven days.

Niagara Motor & Mfg. Company, Dunkirk; item one, \$950, Dunkirk, delivery three days, about five days; one-A, \$950, Dunkirk, delivery three days, about 10 days.

The Clifton Motor Works, Cincinnati, \$994, Cincinnati, delivery three days, about 12 days; one-A, \$870, Cincinnati, delivery three days, about 12 days.

Hatfield Machinery Company, Middletown; item one, \$1250, Middletown, delivery 14 days, about 14 days; one-A, \$1250, Middletown, delivery 14 days, about 14 days.

Sterling Engine Company, Buffalo, item one, \$1300, Buffalo, delivery two days, about 10 days; one-A, \$1300, Buffalo, delivery two days, about 10 days.

Gas Engine & Power Company and Chas. L. Seabury & Co., New York City, item one, \$1375, New York, delivery 20 days, about 20 days; one-A, \$1375, New York, delivery 20 days, about 20 days.

Buffalo Gasoline Motor Company, Buffalo, item one, \$1512, Buffalo, delivery seven days, about 18 days; one-A, \$1512, Buffalo, delivery seven days, about 18 days.

Corliss Gas Engine Company, Petaluma, Cal., item one, \$1650, Petaluma, Cal., delivery three days, about 30 days; one-A, \$1650, Petaluma, delivery three days, about 30 days.

Standard Motor Construction Company, Jersey City, item one, \$2000, Jersey City, delivery 10 days, about 10 days; one-A, \$2000, Jersey City, delivery 10 days, about 10 days.

Bids were received for drainage pumps for the Yuma project, Ariz., on April 14, under advertisement No. 286-F., as follows:

Item one, price, time, and point of delivery; one-A, price, time, and point of delivery; two, price, time, and point of delivery.

United Iron Works, Oakland, item one, \$980, delivery 15 days, about 40 days, Oakland; one-A, \$980, delivery 15 days, about 50 days, Oakland; two, \$50, delivery 15 days, about 40 days, Oakland, Cal.

Krogh Mfg. Company, San Francisco, \$1020, delivery 10 days, about 25 days, San Francisco; one-A, \$1020, delivery 10 days, about 25 days, San Francisco; two, \$42, delivery three days, about three days, San Francisco.

Henry R. Worthington, San Francisco, item one, \$1050, delivery 15 days, about 63 days, Harrison; one-A, \$1050, delivery 15 days, about 63 days, Harrison; two, \$78.50, delivery two days, about two days, San Francisco.

Buffalo Steam Pump Company, Buffalo, \$1400, delivery 30 days, about 60 days, North Tonawanda; one-A, \$1400, delivery 30 days, about 50 days, North Tonawanda; two, \$65, delivery seven days, about 30 days, North Tonawanda.

Pelton Water Wheel Company, San Francisco, \$1550, delivery 11 days, about 45 days, San Francisco; one-A, \$1450, delivery 14 days, about 58 days, San Francisco; two, included in item one.

Byron Jackson Iron Works, Los Angeles, item one, \$1825, delivery 20 days, about 45 days, West Berkeley; one-A, \$1750, delivery three days, about 35 days, West Berkeley; two, \$77, delivery two days, about three days, West Berkeley.

Imports into Italy of all kinds of iron and steel totaled 846,757 metric tons in 1913, as compared with 952,757 tons in 1912, a falling off of 106,000 tons.

## Judicial Decisions

ABSTRACTED BY A. L. H. STREET

**RECLAMATION OF MACHINERY BY SELLER.**—When machinery is sold under a contract which reserves title in the seller to secure payment of the purchase price, and the buyer makes default in paying installments, the seller is under no obligation to return payments already made or notes given for unpaid installments before being entitled to recover possession of the machinery. (Minnesota Supreme Court, C. W. Raymond Company vs. Kah, 145 Northwestern Reporter 164.)

**SELLER'S RIGHTS TO RECOVER CONTRACT PRICE.**—Under a contract to install machinery in a mill, the seller is entitled to recover the full contract price after having made delivery of the machinery, although the buyer refuses to permit installation. (Kansas Supreme Court, National Supply Company vs. United Kansas Portland Cement Company, 138 Pacific Reporter 599.)

**IMPOSITION OF PRICE RESTRICTIONS.**—A manufacturer of a patented article may require, as a condition upon its sale, that no parts not made by him shall be substituted for those sold, and one who sells parts to be resold and used in violation of such condition is liable as for infringement. (United States District Court, Southern District of New York, Rajah Auto Supply Company vs. Rex Ignition Mfg. Company, 209 Federal Reporter 622.)

**VALIDITY OF SUNDAY TRANSACTION.**—When a contract to sell goods is formed by an order given by the buyer, afterward accepted by the seller, the transaction is not rendered invalid on account of the fact that the order was taken by a traveling salesman on Sunday, if it was not accepted until a week day, since the contract must be deemed to have been entered into or the latter day. (Alabama Supreme Court, Wheeler vs. Krohn, Fechheimer & Co., 64 Southern Reporter 179.)

**DELIVERY TO CARRIER AS DELIVERY TO BUYER.**—Ordinarily when goods are ordered for shipment to the buyer, delivery to the carrying railroad company constitutes delivery to the buyer, unless the agreement of sale manifests a contrary intention of the parties. When a contract provides for delivery at the destination, but fails to disclose whether it was merely intended that the seller should cover freight charges or whether it was understood that title should not pass until the arrival of the shipment, it is open to the parties to show by oral evidence what the understanding was on that point. (Georgia Supreme Court, McCook vs. Halliburton-Myer Company, 80 Southeastern Reporter 863.)

**RIGHT OF SELLER OF MACHINERY TO MECHANIC'S LIEN.**—One who installs machinery in a manufacturing plant under contract with a lessee of the building is entitled to enforce a mechanic's lien to secure payment of the agreed price, if the machinery has been so firmly fixed to the real estate as to become a part thereof, although, with the landowner's consent, the machinery may have been treated as personalty in a chattel mortgage given by the tenant to a fourth party. (Minnesota Supreme Court, Northwestern Lumber & Wrecking Company vs. Parker, 145 Northwestern Reporter 964.)

**CORPORATION AS SUBJECT OF BANKRUPTCY PROCEEDINGS.**—The directors of a business corporation organized under the laws of Pennsylvania have authority to cause a petition to be filed to adjudicate the company a voluntary bankrupt, without first obtaining the consent of the stockholders; and such a corporation may institute voluntary bankruptcy proceedings without regard to whether it is in fact insolvent. (United States District Court, Eastern District of Pennsylvania, in re Foster Paint & Varnish Company, 210 Federal Reporter 652.)

**SUBSTANTIAL COMPLIANCE WITH CONTRACT.**—A contract to install machinery, etc., in a manufacturing plant for the sum of \$9283.76 was substantially complied with, although there were defects in one of the things furnished remediable at a cost of \$100. (Wisconsin Supreme Court, Toepfer vs. Sterr, 145 Northwestern Reporter 970.)

## Trade Publications

**Automatic Stokers.**—Detroit Stoker Company, Detroit, Mich. Booklet entitled "Why." Concerned with the use of automatic stokers by the manufacturers of automobiles, parts and accessories. The booklet is made up almost entirely of engravings presenting views of the plants and the boiler rooms in them. Tables showing the efficiency secured by the combination of an automatic stoker and a boiler and the chimney heights for which stokers are recommended are given. Views of the stoker, which was illustrated in *The Iron Age*, February 9, 1911, are included.

**Expansion Joints.**—Alberger Pump & Condenser Company, 140 Cedar street, New York City. Bulletin No. 19. Presents a description, which is supplemented by illustrations, of a line of expansion joints for low and high pressures. For use in connection with pressures up to 160 lb. a corrugated copper cylinder is used, while for pressures up to 200 lb. a nest of stamped circular steel disks welded together to form a flexible bellows is employed. Mention is made of the anchors and guides used in connection with the joint, and there is a view showing the approved method of installation. Tables of dimensions of the joints, anchors and guides are included.

**Iron Sheets and Plates.**—Inland Steel Company, First National Bank Building, Chicago, Ill. Booklet. Pertains to Vismera pure iron sheets and plates, which are guaranteed to contain 99.86 per cent. pure iron. A description of the iron is given, followed by a list of the various uses to which it can be advantageously put. It is marketed in the form of black, galvanized, corrugated and roofing sheets and sheared plates. Tables of the sizes in which these products can be supplied are given, together with a table of the weights of black and galvanized sheet steel.

**Gas Producer.**—Dornfeld-Kunert Company, Watertown, Wis. Pamphlet. Calls attention to a producer for converting anthracite coal, coke or charcoal into gas suitable for power or fuel purposes. A description of the producer is given, the text being supplemented by a number of engravings, and this is followed by directions for the operation of the producer and a statement of the uses to which producer gas can be put. Drawings showing typical plants are included.

**Pressed Steel Shapes and Wrenches.**—Star Mfg. Company, Carpentersville, Ill. Catalogue No. 14. Refers to a line of special and pressed steel shapes and a number of different kinds of wrenches. All of these are illustrated, and in the case of the wrenches brief descriptions are included. Mention is also made of blank and finished implement shapes that can be supplied.

**Valves.**—Ohio Brass Company, Mansfield, Ohio. Catalogue No. 50. Supersedes all previous catalogues and gives general descriptions and specifications for a line of valves of the radiator, globe, angle, check and lock and shield types. Mention is also made of other products, such as elbows, gauge cocks, water gauges and pressure regulating valves. For the most part two pages are devoted to each article, an illustration appearing on one page with a brief description and list of the sizes in which it can be supplied on the facing one. A number of dimension tables are included.

**Hopper Wrench.**—Hess-Steel Castings Company, Witherspoon Building, Philadelphia, Pa. Folder. Describes an automatic safety wrench for use in opening the hoppers of drop-bottom or side dump cars. The special feature of this wrench, which is of the ratchet type, is that it is practically impossible for the operator to be injured at the instant the door opens. A number of engravings showing the various positions of the wrench, which was illustrated in *The Iron Age*, January 22, 1914, are presented.

**Pyrometers.**—Brown Instrument Company, Philadelphia, Pa. Catalogue No. 9. Devoted to a line of indicating and recording pyrometers. After pointing out the special features of these instruments and giving data on where they are used, which is supplemented by numerous engravings, their construction is discussed. The pyrometers covered include all of the standard types and mention is made of a number of accessories that can be furnished.

**Heavy Steel Plate Work.**—William B. Pollock Company, Youngstown, Ohio. Supplement No. 28 to a general book of views of modern blast furnaces. Contains illustrations of the recently completed blast furnace of the Youngstown Sheet & Tube Company, all four of which were built by this company. Views are also shown of 45-ton metal and 260 cu. ft. cinder cars used in the open-hearth plant.

**Can Making Machinery.**—Max Ams Machine Company, Mt. Vernon, N. Y. Cloth bound book entitled "The Seal of Safety." Size, 6 x 9 in.; pages, 266. Illustrates and describes briefly an extensive line of double seaming machines for square, round and irregular shaped cans, also body and lining machines, notching machines and an inclinable power press. In addition to the matter descriptive of the company's machines, considerable general information is given on the

canning industry, legal matters of interest to canners, a list of trademarks and a number of reference tables. Lists of associations in the canning and packing industries are also included.

**Gears.**—Woburn Gear Works, 32 Nashua street, Woburn, Mass. Catalogue. This is the company's 1914 catalogue describing and illustrating a line of gears, sprockets, chains, etc., together with iron and brass grooved pulleys and ball bearings. In connection with each article listed an engraving is given, with a brief description and a table of the various sizes that can be supplied.

**Centrifugal Fire Pumps.**—Goulds Mfg. Company, Seneca Falls, N. Y. Bulletin No. 118. Describes a line of centrifugal fire pumps, for which the special advantages of large capacity in proportion to the floor space required, simple construction, adaptability for various types of direct-connected drive and the maintenance of a steady discharge are claimed. The text matter is supplemented by a number of engravings of the pumps, both assembled and partly dismantled. Instructions for installing and operating the pumps are given, together with a table of capacities.

**Pneumatic Pyrometer.**—Uehling Instrument Company, Passaic, N. J. Pamphlet. Mentions the advantages of a pneumatic pyrometer where the temperature at any given point is to be recorded continuously. These instruments can be furnished in single, double or quadruple form, the last two being particularly well adapted for blast furnace use. Illustrations and brief descriptions of the different instruments are given, and there is a reproduction of a chart showing how it is possible to secure three records on the one chart. An illustrated description of this pyrometer appeared in *The Iron Age*, August 7, 1913.

**Iron Fences and Doors.**—Potts Mfg. Company, Lock Box 87, Mechanicsburg, Pa. Two folders. One lists a number of different types of iron fences, grill and ornamental iron work, etc., while the other calls attention to an easily opening iron cellar or pavement door. Views of the different fences and the door are given, and a table of sizes in which the latter can be supplied is included.

**Air Compressor and Milling Attachment and Compound Table.**—Hinckley Machine Works, Hinckley, Ill. Two circulars. The first deals with an air compressor which occupies a floor space of 16 x 20 in. and weighs 150 lb. One of the special features claimed for the compressor is a large cooling surface in proportion to its size. The other treats of a milling attachment and compound table for use in connection with an upright drilling machine. A brief description of the attachment is given, together with a number of engravings showing it in use.

**Power Saw.**—Armstrong-Blum Mfg. Company, 339 North Francisco avenue, Chicago, Ill. Circular. Describes a high speed saw, capable of cutting 6-in. round, cold rolled steel.

**Nut Tapping Machines.**—National Machinery Company, Tiffin, Ohio. Circular No. 1024. Describes a 10-spindle semi-automatic tapping machine for handling all sizes of hexagon and square hot pressed nuts, from  $\frac{1}{4}$  to  $1\frac{1}{2}$  in. An engraving of the machine which was illustrated in *The Iron Age*, January 2, 1913, is given, together with a complete description of its design and construction. One of the special features of this machine, which is also built in a 1-in. size with six spindles, is that the spindles rise and lower automatically and the blanks are fed into the machine by the operator.

**Power Hammers.**—Beaudry & Co., Inc., 141 Milk street, Boston, Mass. Circular. Gives a brief description with illustrations of a motor-driven power hammer which was illustrated in *The Iron Age*, January 1, 1914. The hammer is designed for a general line of forging and the steel ram is adjustable on the connecting rod for varying heights above the dies. A table of specifications of the hammer is given, together with views of two styles of belt-driven hammers.

**Superheaters.**—Power Specialty Company, 111 Broadway, New York City. Catalogue. Shows a number of line drawings of details of a locomotive superheater. Under each of the drawings is given a brief description of the part shown.

**Film Recorder and Thermocouple Compensator.**—Thwing Instrument Company, 445 North Fifth street, Philadelphia, Pa. Two circulars. The first contains an illustration and brief description of a capillary film recorder that is intended for use in connection with recording pyrometers, thermometers, etc. From one to five instruments, mounted side by side in a recorder case can be used to give simultaneous records at any desired interval. The other circular describes and illustrates a cold end compensator for thermocouples, which compensates for the "cold end" error over a range of 150 deg. C. This compensator consists of a Wheatstone bridge which is placed in series with the thermocouple. The pyrometer with which it is used may be either a single or multiple record type, or a wall pattern indicator, as is desired.

